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EDITORIAL NOTES—GAS, &c.

The First Dessau Installation in England.

Much instructive information as to the working of the Dessau system of vertical retorts has come to us from the Continent; but it will stimulate interest among gas engineers to know that we are now within measurable distance of having a complete installation on a large working scale in operation under the conditions prevailing in this country, and under circumstances eminently favourable for obtaining absolutely independent testimony. If the Dessau system of carbonization on the intermittent principle of charging and discharging is going to expand in favour among gas engineers in this country, it must be, in the first instance, through the Ayres Quay works of the Sunderland Gas Company, and the working of the system there under the direct supervision of the Engineer, Mr. C. Dru Drury. The Dessau system of carbonization is the choice of Mr. Drury, confirmed by the Manager and Secretary (Mr. J. H. Cox)—a choice determined, and a confirmation given, only after carefully investigating and considering the merits of other systems, so far as was possible at the time a decision in the matter had to be arrived at by the Directors. The Ayres Quay Gas-Works have been (or rather the work is within a few weeks of being finished) completely reconstructed, save for the gasholders, from outside boundary wall throughout; and an exceptionally fine opportunity is offered here for obtaining results from the vertical retorts unvitiated by production from, or other causes associated with, extraneous working. The station depending solely upon the vertical retorts for its make of gas, there can be no possibility of error in categorically defining working conditions, and in stating the results realized from those conditions. Labour, fuel account, and make and quality of gas and of secondary products, will all be capable of exact presentment. We think that those who are interested in the introduction of the system into this country are to be congratulated on having secured such a singularly good opening. However that may be, Sunderland possesses more than ordinary interest for the gas engineer at the present time, and will do so in greater degree before many months are over, and as working experiences accrue.

The first bench of six settings of ten vertical retorts on the works will, before very long, be completed; and elsewhere in this issue a description is given of the progressing structure, and as it will shortly finally appear. In good time before the winter's demand sets in, the settings will be under fire, and so working will be well started ere the diagrams begin to exhibit their highest peak-loads for the year. The bench will therefore have the best possible chance of demonstrating its abilities. It consists of no less than sixty retorts; and with the confirming account of good working that is confidently anticipated, a further fifty retorts will be erected. It will be seen from this that the installation will be the first, in such magnitude as at present, of any vertical retort system to be set to work in this country. But, though this is so, the system has had pretty extensive adoption on the Continent. It will be remembered that, in the recent report of Dr. Lessing to the Carbonization Committee of the Institution of Gas Engineers, it was stated that no less than 4022 retorts on the Dessau plan had been erected, or were under erection, on the Continent; but, although this is so, and although there was a special excursion to the Continent last year, comparatively few British gas engineers have had the opportunity of seeing a bench on the system at work. It is not too much to predict that, when the Sunderland installation is in operation, there will be not a few of the colleagues of Mr. Cox and Mr. Drury who will ask permission to make a pilgrimage to Ayres Quay works, for the purpose of observing with their own eyes the bench and its operations, and of inquiring into the working results.

To those who have not experienced the novelty of seeing beds of retorts destitute of mouthpieces fore and aft, but with entrances and exits respectively on top and underneath the bench, the Sunderland settings will prove somewhat striking. And when at work, there is no reason why Continental experience should not be reproduced here in respect of simplicity of operation, small amount of labour required, and consequently low carbonizing costs per ton of coal, as well as the other results and advantages with which "Journal" readers are now fully cognizant. Of course, if the bench is extended to a further five beds, the figures as to costs—from coal reception to coke removal—realized with the six beds should be appreciably reduced. The materials in the plant at Sunderland are all home made, and the labour all home supplied, excepting (in regard to the materials) the lower part of the retorts, which is exposed to the greatest heat, and the fire-bricks for the combustion chambers. These—and these only—were made by the Stettiner Company, who have had long and exclusive experience in the special requirements of these settings, and consequently know precisely what is needed where the temperature is likely to have the most active influence upon the material. This is satisfactory; but the main thing is that the members of the British gas profession will have their interest in the Dessau system sharpened by the approaching advent in working of the first bench in this country at Sunderland.

Reflections on the German Gas Association Meeting.

The report in last week's "Journal" of the proceedings at this year's meeting of the German Association of Gas and Water Engineers at Frankfort will have indicated that no technical communications of an exceptionally high order of merit or interest were presented. This was not a matter for serious regret, for retrospection is profitable from time to time, and befits the celebration of a jubilee. The Association has now existed for a period of fifty years, and can look back with much satisfaction on a vigorous and fruitful past. Hence the note which dominated the proceedings at the meeting was one of retrospection. The Inaugural Address of Mr. E. Körting, the President, of which a translation, begun last week, is completed in this issue, was retrospective throughout; and so were some of the papers upon water supply. No one, however, who will take the trouble to follow Mr. Körting's review of progress in the gas industry in the course of the past half-century will venture to say that it is not beneficial to pause for a while, and try to learn from the lessons of the past how the problems of the future may most hopefully be approached.

The President's review runs in a spirited and stimulating strain, the full force of which has probably been inadvertently somewhat lessened by the translator. It breathes hope and confidence in the future of the gas industry. Technical advances have done so much in the still recent past towards reducing the cost of manufacturing gas, and increasing the efficiency of the means of utilizing gas for the production of light, heat, and power, that we are disposed to forget, however, that there is a counteracting influence which keeps the price of gas, and therewith the business of gas supply, almost at a standstill. We reduce the labour required on a gas-works, and obtain more gas and more numerous bye-products from a given quantity of coal, and yet there is no sensible reduction in the price at which gas can be sold. In fact, it is only by prompt resort to every fresh improvement in plant, machinery, and processes, and by the exercise of the most careful supervision, that a substantial rise in the selling price of gas has been and can be avoided. The influence which nullifies all the efforts of the managerial

and technical staffs of gas undertakings is the continually increasing cost of labour. It is not only the labour directly engaged in connection with gas manufacture and supply, but also that engaged elsewhere, and in particular in the winning of coal. A decade witnesses a remarkable advance in the cost of the staple raw material of gas manufacture—in twenty years, according to Mr. Körting, the rise in the cost of Silesian coal to the Berlin Gas-Works has been from 17s. to 22s. per ton. This rise is, no doubt, in part due to the oppressive machinations of the German Coal Syndicate; and, in this respect, gas undertakings in this country are perhaps somewhat better off than those in Germany. But, nevertheless, the miners' organizations here and there have, directly and indirectly, imposed conditions on the colliery owners which entail a substantial increase in the wages paid per ton of coal raised; and hence gas-works have to pay more for their raw material than formerly. Then there is the rise in the rate of pay of the men employed by gas undertakings. In so far as those engaged on the gas-works are concerned, labour-saving devices have neutralized the effect of the rise. There is, however, a large and ever-increasing staff engaged outside the gas-works, whose wages are continually in the ascendant. The prepayment gas-meter, mantle maintenance, high-pressure lighting, and most modern developments of the business of gas supply, entail the employment of more and more hands outside the gas-works; and the wages account thereby becomes very heavy. In a few branches of this outside work, labour-saving schemes are becoming practicable—to wit, the impending displacement of lamp-lighters by automatic igniting and extinguishing appliances. Nevertheless, the wages account, as a whole, continues to mount, and all the technical advances of the age only serve to counteract to a small extent its preponderating influence on the cost of the manufacture and supply of gas.

It is pleasing, however, to reflect with Mr. Körting on the great benefits which scientific investigation has conferred on the gas industry. We yield to no one in our admiration for the immense good which the learned Professor at Carlsruhe—Dr. Hans Bunte—has done by his personal work, and through his magnetic influence on his pupils and others, in disseminating a knowledge of the principles of the manufacture and utilization of gas. Known and respected by all at the Frankfort gathering, Professor Bunte who has for many years acted as General Secretary to the German Gas and Water Association, was appropriately enough acclaimed there by Mr. Körting as the most distinguished *savant* who had inaugurated the new era in the gas industry which dawned when rule-of-thumb working began to be ousted by control based on ascertained scientific principles. Yet, if we mistake not, Professor Bunte in this matter would be the first to recognize that he had many predecessors and contemporaries—some in this country, some in Germany, and some elsewhere—whose investigations have been equally beneficial. Moreover, many of these men have been engaged in the daily routine of gas supply, which Mr. Körting shows to be more than sufficiently exacting, and yet have found time to make researches on fundamental problems of gas manufacture which are classical examples of scientific and accurate investigation. The new era in the gas industry was not inaugurated by any one man, but by a host of workers scattered in different countries—a few academically trained, but many self-taught. Among them all, however, Professor Bunte will take a very prominent position; and we tender him our hearty congratulations on the dignity of Honorary Membership of its Council which the Association conferred upon him at the recent meeting.

It is pleasing also to note from the reports of the Association's Committees, summarized in another column, that the new Instructional and Experimental Works of the Association have already done excellent work, in both functions indicated by its title. In regard to Instruction, we may hope that the Fuel Department of the University of Leeds may prove at least as successful; while in the investigation of gas coals much also will be done there, and a great deal is even now being accomplished at the Federal Fuel-Testing Laboratory at Zurich. Collateral researches at three such institutions, under such able direction as that of Professor Bunte, Professor Bone, and Professor Constam, should certainly lead to results and conclusions of great value to gas managers everywhere. Whether the aim of the Carlsruhe and Zurich laboratories—the establishment of a basis for the comparative valuation of gas coals to enable dealings in coal to be made according to the intrinsic values to the user of the particular varieties—will be achieved at an early date is very doubtful. It should be borne in mind, however, that the last few years have witnessed the introduction into contracts for coal for steam raising of clauses specifying a standard calorific power, which were unheard of in earlier contracts. It is not, therefore, beyond the range of possibilities that gas-works may yet buy their coal on the basis of a laboratory valuation of the various consignments.

Examination Results.

The pass lists in the examinations in gas engineering and supply have been issued; and there are two or three noticeable points about them in comparison with the previous year's lists. We might preface these special features by saying that the value of the lists would be enhanced if, in addition to the information as to who are the successful candidates, the numbers were given of the candidates (without mentioning the names of the unsuccessful ones) who entered in each division. To know the proportion of the successes to the total number of candidates would be instructive, as an indication of the assiduity year by year of the students in preparing for the examinations, and would emphasize the need of perseverance on the part of prospective candidates. Judgment as to the effect on success or failure of the stiffness or otherwise of the examinations can be made from the questions themselves, which we are able to publish after the examinations. Subject to the want of knowledge as to numbers who entered, the candidates in the honours grade of gas engineering have done exceptionally well; the total number of passes having been 73, against 51 last year. But that is not the only satisfactory feature. No less than 26 of the 73 have secured first-class certificates, against only 11 of the 51 in the preceding year. We congratulate them. Having regard to the questions, there is the evidence here of an excellent application to studies in the higher branches of gas engineering, manufacture, and chemistry; and it testifies to the efficiency of the educational opportunities offered in the present day—in works, colleges, schools, and technical literature. In the ordinary grade of "Gas Engineering," there were 100 passes, against 104 the previous year. Of the total, 40 succeeded in obtaining first-class certificates, compared with 36 a twelvemonth earlier. In the second class of the ordinary grade, there were 60 passes, against 68 the year before. The new Examiner in Gas Engineering (Mr. W. Doig Gibb) we venture to think has not found the task by any means a simple nor a light one in adjudicating upon the merits of the candidates' work; nor has Mr. J. H. Brearley, the Examiner in "Gas Supply." This division of the examinations has rapidly sprung into popularity among the gas industry's juniors; and the separation of subjects affecting internal structures and processes and external distribution and application has declared itself by the results alone to have been peculiarly appropriate. A year ago 113 candidates were adjudged worthy of certificates—47 in the first class, and 66 in the second class. This year the total of the successful candidates has risen to 139—58 of whom have obtained first-class certificates, and 81 second-class. This is extremely satisfactory and most encouraging. But we do not envy the Examiners their growing tasks. Their chief reward lies in the knowledge that they are doing excellent work for the gas industry. It goes without saying that the expansion of definite technical knowledge among aspirants for official positions in the various branches of work offered by the industry is to the industry's advantage.

A Disaster Averted.

The serenity with which the Home Secretary last year regarded the prognostications of skilled men as to the effects of the Mines (Eight Hours Act) can hardly longer exist. Last week we were trembling on the verge of a national disaster (just when trade cannot stand the introduction of any further disturbing element) by a threatened complete stoppage in the coal-fields. The Act, as the Miners' Federation have known all along, but as their ministerial allies failed or refused to see, has put a new weapon of offence in the hands of the miners; and they will use it, in accordance with tradition, to their own advantage to the utmost extent. The Home Secretary laughed in the faces of those who were disposed to see anything but benevolence and peace in the Act; but the very bringing of the measure into force on July 1 (save in the Northumberland and Durham coal-fields, where it becomes operative as from the 1st of January

next) has shown that the miners are not willing to allow the masters to work the pits in, according to their judgment, the most economical manner within the terms of the Act, and it has further proved the strength of the men in compelling compliance with their wishes, or, as an alternative, bringing about an industrial collapse throughout the country. The scene of the struggle between masters and men has been South Wales; and the miners there were backed, through the Miners' Federation, with the might of the whole of the miners in the country, though, in most of the other coal-fields so far affected by the Act (excepting Scotland and sundry English pits), conditions for the working of the measure had previously been more or less amicably arranged. But this does not stand for much, when the miners throughout the country would be prepared to hand in their notices on the masters, in any one district, holding firmly to the small amount of freedom given them in working within the four corners of the Act.

The Act invests the mine owner, agent, or manager with the right to extend by one the hours of work on sixty days in the year. It does not say this is to be subject to the men's pleasure; but it allows the masters to use the little latitude thus afforded on any days they choose, irregularly or consecutively, so long as the total number of extra hours does not exceed sixty a year. Though there is this permissive power granted to the masters by the Act, the South Wales miners made up their minds to have a voice in the question of how it is to be applied. In other words, the little relief the masters did obtain under the Act is, the miners claim, to be subject to their own will. If this were admitted by the masters, the provision as to the sixty days' latitude would speedily become more or less inoperative. The South Wales owners also desired to work double shifts, which they assert is necessary to enable the maintenance of the output of coal. But the miners protest against this —or rather their objection to it—is that the greater output following the double shift, would, by the liberation of more gas, greatly increase danger, owing to less time being available for the proper ventilation of mines. The suggestion is that in this respect the work of the Welsh miner is more dangerous than that of the English miner. Those were the points in dispute; and the negotiations between the parties might have ended quite satisfactorily in Cardiff (in the way that fortunately they have done) without the untimely intervention of the Miners' Federation in London, who, just before an agreement was arrived at in Cardiff—ill-advisedly we think—took action in a manner that might have stiffened the backs of either or both parties, by resolving that, in the event of disagreement, steps should be taken to effect a national stoppage. That was a serious threat. The situation was critical; but the parties in Cardiff came to an agreement almost at the twelfth hour, determining to settle the sixty hours' question by a test-case; and, as to the double shift, the owners agreed, providing the men did not raise any local obstacle in any mine where it can be shown that such a step can be applied satisfactorily and without danger, that they would consult the men on the subject before putting it into operation.

So a stoppage that at one time looked inevitable has been averted; and we are all thankful for it. The unrest lately among miners in various parts of the country in connection with the arrangements for bringing the Act into force has been all too palpable to those within the line of observation. Without a stoppage, the power of the men has made itself felt in the several coal-fields in settling conditions that will not be without their effect in maintaining prices at a higher level than would have been the case had this Act never had existence. Midsummer is not the best conceivable time, from the miners' point of view, for a stoppage; and it is earnestly to be hoped that the present sense of comparative safety from a national evil in this respect will not receive an ugly shock in the depth of winter, when the new conditions come to be applied to Northumberland and Durham. Any disagreement then would be a bad thing for the gas industry. The Act has given the miners further scope for the exercise of their strength and power; and, from what has already been seen, the measure is bound, it appears to us, to increase the tension between the owners and the employees. It is wondered if the Home Secretary and his ministerial colleagues are as proud of the work they have collectively done in this matter at the present time as they were before they heard the warning voices of men who are more competent than themselves to form an accurate judgment as to the likely effects of that work.

Leeds Makes an Independent Investigation.

A report to which welcome will be given beyond the Leeds City Council is one which has been prepared by a Sub-Committee of the Gas Committee—viz., Mr. C. F. Tetley (Chairman), and Messrs. Ratcliffe (Deputy Chairman), Brown, Hinchliffe, and Ambler—giving, in pithy form, the information they gathered, on a recent visit, in company with the General Manager of the Department (Mr. R. H. Townsley), to Berlin and Cologne, mainly to inspect the extensive settings there on the Dessau system; and, while on the main object, to pick up by the way other striking information. To Leeds, the report will be valuable for the knowledge and impressions gained by those upon whom chiefly falls the responsibilities of conducting the, from our point of view, most important department in the trading activities of the Leeds Corporation. A stay-at-home policy is not productive of any more good to committeemen and directors than to engineers; getting into touch with the affairs of the larger gas industry than their own particular section of it must broaden their knowledge, and make them more efficient for the discharge of their duties. To the gas industry generally, the report will be of value, not because it adds much to the stock of information on the subjects dealt with, but because it gives independent and up-to-date confirmation of the working of the Dessau system abroad.

The Results.

At Oberspree, Mariendorf, and Cologne, the Leeds deputation found, by personal inspection, that nothing had been overstated as to the working of the system—in regard to labour, make of gas, calorific powe purity, and low nitrogen, carbon bisulphide, and naphthalene content; and they also found that retorts at Oberspree had been at work continuously 800 days and at Cologne 705 days, being still in good condition. This point is one on which information had been awaited with curiosity, as there were grave doubts in the beginning of the working of the system, as to the durability and the costs that would be entailed by wear and tear. In Dr. Lessing's recent report to the Institution Carbonization Committee, it was also mentioned that a statement issued quite lately by Mr. E. Körting, together with reports by Messrs. Prenger and Weiss, indicate a durability of the Dessau retort of 900 to 1000, or even more, firing-days, after which probably only the lower parts of the retorts will have to be renewed. The accumulating information under this head is both interesting and satisfactory. However, the Leeds Gas Committee are not going to pin their faith to any particular system yet. They desire to make experiments on their own account, and ask for permission to erect a suitable number of retorts to enable a trial on a practical scale. But they "are not anxious at present to erect a large installation on any one system, as they are not without hope that one of those that work continuously may attain perfection." If vertical retort settings are erected at Leeds, there will no doubt be a conflux of interest in the working from the professionals of the Gas Department of the Corporation and of the Department of Gas Engineering and Fuel at the Leeds University. Generally, matters in connection with carbonization in vertical retorts seem to have been largely quickened lately in this country. From watching and a distant interest, practical steps towards adoption are being made, and many engineers are contemplating what will be their own next move.

Progress of the Gas Industry.

In another part of the "JOURNAL" will be found the principal portions of a paper read many years ago by Mr. Tadman, a former Manager of the Norwich Gas-Works, on "The Origin and Progress of Gas Lighting." As explained in the introductory paragraph, the manuscript of the paper was placed at our disposal by Mr. Tadman's latest successor—Mr. Thomas Glover—and, but for the crowded state of our columns, the extracts now given would have appeared in the issue containing the report of the proceedings at the recent meeting of the Institution of Gas Engineers, with which Mr. Glover's presidency came to a close. They have lost none of their interest, however, by the slight delay which has occurred in publication—indeed, the interest has been somewhat enhanced by the issue of the last returns as to the gas undertakings of the United Kingdom, which were noticed last week. The historical portions of Mr. Tadman's paper are, of course, well known to most people engaged in the gas industry;

but towards the end he gives some figures from a return made to the Secretary of State for the Home Department in 1822. At that time, the three Gas Companies supplying London—the Gaslight and Coke, City of London, and Phœnix—were making 397 million cubic feet of gas in the twelve months. They carbonized 41,447 tons of coal in 1305 retorts, and had 47 gasholders, with a total capacity of 917,940 cubic feet, and 210 miles of mains. The writer mentions that the old Imperial Gas Company were putting up or arranging for several holders of 10,000 cubic feet capacity at their Hackney and St. Pancras stations; while in 1844 they were erecting a "large gasholder and tank capable of containing 500,000 cubic feet." This was evidently regarded as a great advance; and concurrently with it Mr. Tadman records a very general movement in the direction of providing additional storage by gas companies, either by the erection of new or the telescoping of old gasholders. Could he ever have supposed that the further progress of the gas industry would lead to the production of such gigantic structures as those at New York, East Greenwich, and Manchester? We doubt it; and to have talked about abolishing guide-framing would probably have frightened him. It is difficult, owing to subsequent amalgamations, to compare the carbonizing and other figures given above with the statistics contained in the last returns; but those for the Gaslight and Coke and the South Metropolitan Gas Companies may be cited. The former Company carbonized 1,708,612 tons of coal in 1907, made 18,694¼ million cubic feet of gas, and had 2158 miles of mains; the latter carbonizing 1,215,456 tons of coal, producing rather more than 13,081 million feet of gas, and having 1207 miles of mains. Mr. Tadman presented to his audience an interesting record of progress up to date; and we followed his example, in a less readable form, in the statistics given last week. They furnish evidence, as then remarked, that the gas industry's tale of prosperity shows no signs of abatement, despite the severest competition brought to bear upon it.

Sequel to a Gas Explosion.

There was recently tried in the Dublin Law Courts—the hearing extending over six days—a case which is of considerable importance to gas suppliers generally, as well as to the undertaking particularly concerned in it—the Alliance and Dublin Consumers' Gas Company. The interest attaching to the action has induced us to give in to-day's issue what is to all intents and purposes a verbatim report of Mr. Justice Andrews's summing up to the Special Jury—which we are able to do through the courtesy of Mr. Francis T. Cotton, the Secretary and Manager of the Gas Company. The whole of the facts of the case are set forth in considerable detail in the summing up; and it is not necessary to repeat them here. It may, however, be stated that nearly two years ago a serious gas explosion took place in a drapery establishment in Grafton Street, Dublin, from which much damage to property and personal injury to a domestic servant resulted; and the action was brought by Messrs. Forrest and Sons, the proprietors of the business, to make the Gas Company liable. But in this they were unsuccessful, as the Jury found in favour of the defendants. The ground upon which it was sought to make the Gas Company responsible was that there was negligence on their part and on that of their servants, by reason of which the explosion was caused. It appears that the plaintiffs were having considerable alterations made to their premises; and in connection therewith they desired to have removed three cookers which they had on hire from the Gas Company. One of the Company's gas-fitters was there at the time doing other work; and apparently he was told by somebody acting on behalf of the plaintiffs to disconnect the cookers. This he did; and some time afterwards the explosion took place. Investigation showed that the meter was turned on; and, of course, the gas escaped where the disconnection had taken place. The fitter stated that he first shut off the gas at the meter and tightened the plug; and a porter in the employ of the plaintiffs, whose duty it was to turn the meters on and off also claimed to have shut the cooker meter off on the day in question. The fitter, on the other hand, said he had told the porter that he (the fitter) had shut the meter off. The first question put to the Jury was whether the fitter, when he was disconnecting the stoves and shutting off the gas at the meter, was acting with the Gas Company's authority as their servant; and they found that he was not. No doubt this was sufficient to put an end to the attempt to make the Company liable; but, in addition, the Jury, in answer to further questions, held that there was no negligence in the performance of the work on the part of the fitter.

Fitting Up Show Houses.

The electrical people are keeping a sharp look-out on what gas companies are doing in smart enterprise; and the writer of "Installation Topics" in the "Electrical Times" urges electric light undertakings to take a leaf, or rather several leaves, out of gas companies' books, and adopt similar methods for promoting the consumption of electricity in small and medium-sized property. Here is one instance that has upset our friend. In one of the better class London suburbs, the Gas Company have arranged with a local builder to pipe, free of all cost, any houses he erects. Six such residences have been completed; and the Company have prevailed upon the builder to finish one quite ready for occupation. This house has since been fitted up by the Company with every gas-consuming device likely to be adopted by a tenant. The appliances installed include gas-fires, gas-heated copper, gas-cooker, geyser in bathroom, hot-water circulator in parallel with kitchener, and attractive pendants and brackets in all rooms. These are shown in operation to anyone inspecting the house. A tenant taking the sample house, or one of its neighbours, is invited to have any or all of the fittings exhibited, and to pay for them outright at a substantial discount from the list prices, or to use them under a hire-purchase or rental scheme—no charge being made for the fixing or for the original piping. Bills are printed by the Company advertising the property; and in return for this publicity of his houses, the builder is asked to use the show place as his office, so that he is always on the spot to conduct "victims" [our contemporary's choice of term!] through the place. Such enterprise, it is naturally thought by our envious friends, is "worthy of a better cause" than lighting and heating by gas.

An Electrical Example, and More Gas Enterprise.

The foregoing exhibition of envy at what a Gas Company are doing appeared one week in the "Electrical Times;" and the following week there was great rejoicing regarding a model house that the South Metropolitan Electric Light and Power Company have rented at Hither Green to attract consumers on the St. German's Estate. The model electric installation is said by our contemporary to be an improvement upon the house the Gas Company in another district have provided, in that a qualified lady attendant is always on the premises to interview callers. Most of the houses on the St. German's Estate are of rental values between £32 and £40; and it is this class of householder that it is so difficult to rope-in as electricity users. The model house is a small double-fronted residence rented at £36, and situated at the corner of a road through which the residents on the estate pass from Hither Green Station. It is fitted up with the idea of impressing likely consumers with the cheapness with which "good" wiring can be carried out, and the low cost of current to give "adequate" illumination under modern conditions. We have seen the house, and are not impressed by the lighting. The fittings all look cheap; and there is a poverty of illumination. In the hall is a plain cord pendant, with a 16-candle power Osram lamp. The drawing-room is lighted by a pair of single-drop pendants, carrying 25-candle power lamps; and a three-light cord electrolier with 16-candle power lamps gives, according to the estimate of the electrical writer, "ample" illumination in the dining-room. In the kitchen, bedrooms, and landing, plain cord pendants with lamps of 16 or 8 candle power are used. There are in all sixteen points of lighting. An outside illuminated sign calls attention to the display within; and every evening from dusk to bedtime all the lights are running, and the blinds are kept up to attract attention. On top of this—and here again we suppose that the enterprise will be considered by our friend as "worthy a better cause"—the writer of "Installation Topics" learns that on an adjoining estate, where a somewhat better class of property is about to be erected on an extensive scale, the competing Gas Company have acquired a six years' lease of a pretentious corner house, with the intention of equipping it with every gas-consuming device likely to be employed in such residences. It is to be under the management of a lady resident. There is a reality about this method of advertising that

should do an immense amount of good. In a show-room, one can make a choice of fittings all right; but a demonstration of lighting and heating there (unless special apartments are provided) is not the same thing as in the furnished rooms of a house.

Federation of Trade Unions.

Some idea of the cost of strikes from the workers' point of view (the loss entailed on employers and on trade generally is, of course, quite a separate matter) can be gathered from the tenth annual report of the General Federation of Trade Unions, which deals with the twelve months to March 31, and which the Secretary (Mr. W. A. Appleton) says "covers the most exciting period of the Federation's existence." In the period referred to, the Federation dealt with 638 disputes, involving 54,962 persons, which in benefits alone cost £123,000. A good balance having been brought forward, it was possible to meet this demand on the funds; but the reserve fund was largely decreased. At the commencement of the year under review, the Federation consisted of 122 affiliated societies; and during the twelve months fifteen other societies, representing 18,860 members, joined, while one society lapsed and several others united forces. There are thus 131 societies now affiliated, the aggregate membership of which is 658,998. In the ten years since its foundation, the Federation has seen the number of affiliated societies trebled and the membership nearly doubled; but Mr. Appleton says there are still many societies whom the sense of solidarity ought to bring inside the Federation, and the movement cannot be complete or really effective until it includes all those competent to join. According to the Secretary, the immediate outlook is not a promising one, for he says: "When the General Federation accepted liability for benefit for the individual dispute, it not only increased the administrative work, but it disturbed the financial basis. The total of the year's disputes may to some extent be accounted for by the state of the labour market; but those who expect any great diminution in the number are likely to be mistaken. The conditions which make for unemployment are little changed; and the rule relating to individual benefit is more generally understood and acted upon. Even with existing liabilities, the possibilities of increasing the reserve will be uncomfortably small; while any addition to the liabilities, without a corresponding addition to the income, would certainly, from the financial point of view, be quite inexcusable."

The Nitrate of Soda Market.

The combination of producers for the restriction of production and shipments of nitrate, which came into operation in April, 1901, for five years, and was at its termination renewed for a further three years, expired on March 31, and was dissolved, owing (Messrs. Montgomery and Co. remark, in their half-yearly report on the nitrate of soda market) to the inability of those entrusted with its renewal to bring all the interested parties into line. Generally speaking, however, it seems that the mass of producers are in favour of combination; and under these circumstances, it is thought there can hardly be a doubt that a way will be found to disperse any difficulties which may now stand in the way of its consummation. It is urged that, with prices slipping away as they have been doing recently, "both the cheap and the dear producer is coming to see that it is a wiser policy on the part of the dear producer to be reasonable and thus save himself from ruin, and in the case of the cheap producer to meet his fellow producers part of the way, and thus, while obtaining a much better price for his output, conserve his grounds, which he would, with a free hand, be depleting in order to try and gain with perhaps double the quantity of nitrate the same annual income." Negotiations for a renewal of the combination are now proceeding unofficially, and considerable progress in this direction is in some quarters said to have been already made, while other authorities would appear to be less hopeful of a successful outcome. One of the difficulties seems to be that about one-sixth of the total production of the nitrate fields is now controlled by German interests, which would naturally be disinclined to submit to control by a foreign committee, though the main question still remains the settlement of the proportions between the companies who can produce nitrate cheaply and those who can only work profitably when the price is fairly high. The present year opened with cargoes quoted at about 8s. 7½d. per cwt., cost and freight; but the price advanced to 9s. 11d. and 9s. 11½d. in the middle of May. From this time, the cargo market began to decline; and by the middle of June no better than 8s. 7½d. per cwt., cost and freight, was obtainable for an arrived cargo. The month closed with prices steady at about 8s. 7d. to 8s. 8d. per cwt., cost and freight, for arrived and due cargoes, and the prospect of a more than usually good consumption for July, by reason of the backward condition of some crops.

Ticehurst Debentures.

The Ticehurst and District Water and Gas Company—one of the progeny of the No. 99, Cannon Street group of promoters—are advertising £1500 of 5 per cent. debentures at par. The advertisements do not give any figures as to the total capital issued, amount of business being done, profits, and dividends paid. These are matters into which anyone contemplating investment should very carefully inquire. There is an application form attached to the advertisement, in which the applicant for debentures requests the Directors to allot him or her the amount applied for, *or any less amount*. These Directors, like most of the members of the Boards of the Companies that have had their origin at No. 99, Cannon Street, are humorists. We have never heard of applicants for any shares in these companies who have been allotted a *less amount* of stock or shares than that for which application is made. But then this invitation for inquiries for these debentures comes from the gas-works, Ticehurst, near Tunbridge Wells. A. E. Locke signs the advertisement as Secretary. There was a time when that name appeared in similar official capacity in connection with the North Sussex Gas and Water Company.

Stamp Duty on Supply Agreements.

In the "JOURNAL" for March 9 last, comment was made upon a case of some importance to both gas and electricity suppliers—in fact, to the trading world generally. It had been before Mr. Justice Channell; and his Lordship was very sympathetic towards those against whom, in the present condition of the law, he had to give judgment. The winning parties were the Inland Revenue Commissioners; the losers the County of Durham Electrical Power Company. The latter had entered into an agreement with Messrs. Snowball, Son, and Co., of Gateshead-on-Tyne, for the supply of electricity for seven years, the terms being a fixed payment per quarter, and 1d. per unit in addition for all current taken. The Inland Revenue Commissioners came along, and contended that the agreement or memorandum related to the sale of goods, wares, or merchandise within Exemption 3 of the Stamp Act; and therefore they held that stamp duty was payable at the rate of 2s. 6d. per cent. of the aggregate amount of the minimum annual payments for seven years. The Company, on the other hand, maintained that no *ad valorem* or other duty was payable; and the question for the Court was whether the assessment was correct. Mr. Justice Channell, it will be remembered, held that it was; but he suggested there was a hardship on the commercial world here, and that an agitation should be commenced to secure relief. The matter has now been before the Master of the Rolls, and Lords Justices Farwell and Kennedy; and they have also decided in favour of the Crown. It would therefore appear that Mr. Justice Channell's advice to seek relief through Parliament is the only possible course open.

A Friendly Act.—Mr. A. Hugh Seabrook on his transfer from East to West (in other words, from the management of the West Ham Electricity Department to that of Marylebone) does not forget his faithful henchman, Mr. H. H. Holmes, whose name occasionally appears in the "Memoranda" and our "Correspondence" columns. Mr. Seabrook has reported to the Marylebone Council that the sale of current for lighting will seriously decrease when the metallic filament lamp becomes better known, and from other directions the department is likely to experience a declining revenue. Mr. Seabrook states that his position is that he has two different and equally important classes of work to do: (1) Overhaul organization, and (2) develop supply. It is necessary for the two to go on simultaneously; but he does not feel it would be wise to tackle the two together single-handed. He has therefore asked permission to engage Mr. H. H. Holmes, Sales Manager at West Ham, who has had great experience in the direction of development, at a salary of £400 a year. The Electricity Committee have decided in favour of Mr. Holmes being appointed.

WILLIAM A. McINTOSH VALON.

An Appreciation.

We mourn to-day the loss of one whose work has left its impression upon the gas industry, who was always loyal to the industry's interests, and whose friendship will always be cherished by those—and they were many—who knew him whether intimately and over long years, or less closely and over a shorter space of time. W. A. M'Intosh Valon is a name that has stood prominently in the industry's work. As he ended a long life, so he became known to his early contemporaries in the industry. He was ever a thinker and a worker—was conscientious, impartial, practical to a fault, genial, and generous in word and deed. There were no two sides to this friend at any time during the long course of years that he was known to the men of the gas industry. What he said was what he believed; and if what he believed turned out to be wrong, he was not above acknowledging it. He always, too, claimed the right, with advancing knowledge and changing times and conditions, to replace previously expressed opinions by those befitting the day and the circumstances. What he claimed for himself in this respect, he did not deny to others. It was this openness of mind, his transparent honesty of purpose, the characteristic justness of his acts, and his fearlessness that endeared him to his friends, and that gained the confidence of those who were his clients professionally.

We go back in memory to the years at Ramsgate, and to those vigorous days when, towards the end of the seventies and the beginning of the eighties, generator and regenerative firing were, as applied to the carbonization of coal for the production of gas, in their nascent stages. In the forefront of the advocacy in those days for the more scientific system of firing retort-settings (following the teachings and the practices of Frederick Siemens) was Mr. Valon, as he was also in the forefront of demonstration work by what he did at Ramsgate and Westgate. It was characteristic of him to get the utmost out of simplicity, before he would step beyond it to any form of complication; and in the early eighties his personal work, the frequent statement of his views, the strength of the case he was able to present, did much in preventing the experimentalists in the new forms of retort-heating from taking flights into complication that would have served no good purpose. His was at once an encouraging and a restraining influence in the work of those days; and an encouraging and a restraining influence that eventuated in much good. How we recall the discussions of the times with an intimate circle of friends, names in which that first come to mind being George and Frank Livesey, John West, Charles Gandon, William Broadberry, Jabez Church, Arthur F. Phillips, Hartley, Sugg, and others—not only on this subject of retort heating, but on many others. His name, too, will always be associated with the stop prepayment meter, and its introduction in places instead of slots. Of him it can also be truly said that, with advancing years, he never was behind the times—in thought, in the formation of ideas, in initiative, and in execution, he lived well to the day and to its purposes.

Before leaving Ramsgate, the services of Mr. Valon had been sought by so many in the gas industry in the capacities of consultant, adviser, and as expert witness, that this to a large extent induced the relinquishing of official service, and the establishing of himself in London, with his eldest son Arthur, in order to secure the complete freedom necessary for the wider professional work that held great interest for him apart from the reward. As an engineer, he was liked because he was practical; as an adviser, because he was conscientious. In parliamentary work, he fought well for the cause to which he gave adherence; and in his word Committees placed a large amount of trust. It is not difficult for Committees, after a little experience, to judge whether a man is purely a partizan, or is making attestation in honest belief. The latter was the characteristic that clung about the name and person of our departed friend. With most of the great gas and water assessment cases that can be recalled as having taken place during recent decades, Mr. Valon was associated. He was not an inventor in the ordinary sense of the word; but in the special paths of the industry in which he walked, he has left behind him a good record, a good name, and many regretting that they will have him no more as pleader or defender, or by their sides as an ally. Sons are in the industry bearing the revered name to which we do honour to-day; that name it will be their effort, by their own work, to maintain as it has been left by him whose loss we mourn. To Mrs. Valon, to sons and daughters, and to the family generally we express the profound sympathy of the whole gas industry in the sorrow under which they are bowed to-day.

The subject of the foregoing appreciation died last Saturday at his residence at Kennington Lees, near Ashford, as the result of heart failure, in his 71st year. Deceased had not been attending so closely to business during the past few months as formerly; but, so far as we are aware, there was no reason to suspect that his services in the special department of his profession in which he laboured would shortly no longer be available.

In early life, Mr. Valon was with Mr. Thomas Cubitt, of Millbank, Westminster, in whose shops he was trained for the profession of a civil engineer. Probably his first work in connection with gas engineering was the superintendence of the construction of a large gasholder tank for the old Equitable Gas Company. He was subsequently associated with his brother-in-law, Mr. David Watson, the Chief Engineer of the London Gas Company; and was afterwards appointed Outdoor Superintendent to the Commercial Gas Company. In 1870, he obtained the position of Engineer and Manager of the Isle of Thanet Gas Company, and superintended their works at Ramsgate and Margate; but, on the purchase of the former and the water-works by the Improvement Commissioners, he became their Engineer. He reconstructed the water-works and introduced the constant supply; and, in connection with the latter work, erected a water tower to serve the higher parts of the town and district. The tank has a capacity of 250,000 gallons; and when it was completed it was regarded as the largest elevated artificial reservoir in England. In 1891, Mr. Valon was appointed Engineer to the Ramsgate Corporation for the purpose of carrying out the sea-front improvements which have added so much to the attractiveness of the popular Kentish watering-place. Early in 1901, he evolved a scheme for connecting the harbour and the gas-works by means of a tunnel, primarily for the conveyance of the coal to the works, and secondarily for the transmission of other material required there or elsewhere. He was a Justice of the Peace for Ramsgate.

When Mr. Valon went to Ramsgate, he had considerable private practice as a Consulting Gas and Water Engineer; and this he gradually increased to such an extent that he decided to devote himself entirely to it. Accordingly, early in 1902, he made known to the Gas and Water Committee of the Corporation that it was his intention to resign his position as their Resident Engineer at the end of the then current financial year. The notification dated from the 25th of March, and took effect in September. The change did not, however, necessitate the severance of his connection with the Isle of Thanet, as he was the Consulting Engineer to the Broadstairs District Council as well as Engineer to the Westgate Estate; and he had the responsible charge of the works of the Gas Company supplying Westgate and Birchington, as well as those of the Water Company serving the district. He was also Joint Engineer with his son, Mr. Arthur Valon, to the Minster and Stourmouth District Councils. After he had severed his connection with Ramsgate, he and his son transferred their office staff to Temple Chambers, London, where they practised as Consulting Gas and Water Engineers. About two years ago, however, they removed to Caxton House, Westminster. To enumerate the many cases in which Mr. Valon had been engaged would be difficult at the moment; but it may be mentioned that in the year 1891 he was retained by nearly the whole of the Assessment Committees of London as chief expert witness against the Gaslight and Coke Company.

Turning to the technical side of Mr. Valon's life-work, he was elected a member of the British Association of Gas Managers in 1872, passed into the Gas Institute ten years later, and was President in 1892. The following papers were read by him:—

1882.—"Experience with Generator Furnaces."
1884.—"Generator *v.* Regenerator Furnaces."
1888.—"Use of Oxygen in the Purification of Coal Gas."
1889.—"Manufacture of Oxygen on Gas-Works, and its Practical Application for Purifying."
1892.—"Royal Commission on Labour." *

He was four times awarded the President's Medal, and once (in 1894) the Birmingham Medal—the last being "for the great services rendered by him to the gas industry." Mr. Valon was a member of the present Institution, and also of the Southern District Association of Gas Engineers and Managers, of which he was President in 1883. Six years later, he read before the Association a paper on "The Oxygen Process of Gas Purification." He was a member of the Society of Engineers, and was President in 1893. His occupancy of the presidential chair of the Gas Institute brought with it, as customary, an honorary membership of the Société Technique du Gaz en France. He was admitted an associate member of the Institution of Civil Engineers on May 4, 1875; and a member of the Institution of Mechanical Engineers in 1880.

The funeral is arranged to take place to-day.

* Mr. Valon gave evidence before the Commission, and it was printed in the "Transactions" of the Institute.

Mr. John Marsland, for many years Manager of the Sowerby Bridge Gas-Works, died last Tuesday night at the age of 76. He became connected with the Salford Gas-Works early in life; and later secured an appointment at Newry. In 1881, he was appointed Manager at Sowerby Bridge; and this position he retained until 1902, when he retired. Deceased leaves a widow and two married daughters.

To prevent the spreading of rails, a special form of tie-rod is suggested by Mr. H. Herden, Chief Engineer of the Buffalo and Susquehanna Railway. It consists of a straight steel rod with bent ends that form spikes for the inside of the rail, and are driven through holes in the tie-plates. With this scheme the gauge cannot widen without breaking the rod or tearing up a tie-plate, either of which would be quickly detected, or shearing the spikes. Such rods might also be used with half ties, one under each rail, giving value to the good portion of removed ties.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 65.)

The Stock Exchange had a variable time last week. It opened heavily enough, oppressed by the weight of the settlement the week before, to which was presently added grave apprehension of dislocation in the coal industry. But before the close the situation became lighter. On Monday, a depressing factor was the announcement of three failures—albeit small ones—and markets of varied character (from Consols to mines) were down. Business continued very quiet on Tuesday, and the general tendency was dull. Railways were flat in fear of the coal difficulty; but Consols throve. On Wednesday, some degree of improvement was perceptible; and markets which had been kept down by selling orders breathed more freely. Railways were much depressed. On Thursday, the feature was the sharp recovery in Railways upon the settlement (if such it can be called) of the Coal Mines dispute. But whether the postponement of the strike period (for that is practically what it really amounts to) from the summer to the winter season can be regarded as satisfactory in the long run, is another question. However, on the Stock Exchange sufficient unto the day is the evil or good thereof, everybody cheered up, and there was a general hurry to get in first at good prices. Business fell quieter on Friday, and Rails rather re-acted; but some good markets were firm. Saturday's general tendency was also favourable. Consols rose fractionally. In the Money Market, there was a good, steady demand up to the close of the half year, after which the market supply filled up again, and the week closed with very easy rates. Business in the Gas Market was, on the whole, not much more abundant than the week before, but one or two issues exhibited unusual prominence. In Gaslight and Coke, the ordinary was rather quiet, and showed no feature in particular. Transactions were practically unchanged, ranging from 103 to $103\frac{3}{4}$. The secured issues were but little noticed; the preference being dealt in at $105\frac{1}{4}$ and 106, and the debenture at 86. South Metropolitan was quiet and unchanged at from 122 to 123. Nothing was marked in Commercials; but the $3\frac{1}{2}$ per cent. rose a point. Among the Suburban and Provincial companies, Alliance and Dublin old realized $17\frac{3}{4}$, Brentford new 196, British from $42\frac{7}{8}$ to $43\frac{1}{4}$, Bournemouth B $16\frac{7}{8}$ and 17, Bromley A $120\frac{1}{2}$ and 121, Ilford A $140\frac{1}{2}$ and $141\frac{1}{2}$ (a rise of 1), ditto debenture $103\frac{3}{4}$ (a rise of 2), West Ham $121\frac{1}{2}$, and ditto preference $126\frac{3}{4}$. In the Continental companies, Imperial was active, with transactions at from 178 to $180\frac{1}{4}$ and one special deal at $176\frac{3}{4}$, ditto debenture fetched from 96 to 97. Union made from $96\frac{3}{4}$ to $97\frac{3}{4}$, European part-paid $18\frac{7}{8}$, and Malta $4\frac{11}{16}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at from $13\frac{15}{16}$ to $14\frac{1}{16}$, Cape Town debenture at $80\frac{3}{4}$ (a rise of 2), Monte Video $12\frac{3}{4}$ and $12\frac{7}{8}$, Oriental $138\frac{1}{2}$ and $138\frac{3}{4}$, Primitiva $6\frac{15}{16}$, River Plate from $14\frac{7}{8}$ to $15\frac{1}{8}$, ditto debenture $96\frac{1}{2}$ and 97 (a rise of 3), San Paulo $14\frac{1}{4}$, and ditto preference from $11\frac{7}{8}$ to $12\frac{1}{4}$ (a rise of $\frac{1}{4}$).

ELECTRICITY SUPPLY MEMORANDA.

Contrary Municipal Views on Policy—Sound and Unsound Finance—Municipal Engineers opposed to Profit Appropriation for Rates—Unremunerative Units for Power—Yet, Still too Dear—Preference for Isolated Plants—Metallic Filaments and Dwindling Revenues.

Some eight days after the terrific explosion in Manchester—caused by faulty electrical cables, and producing much consternation in and around Victoria Buildings, and an amount of food on a corresponding scale for public reflection—the Incorporated Municipal Electrical Association met in the city under what an electrical contemporary describes as the "clattering" arc lamps in the Whitworth Institute. There was much that was hoary, and little that was new, about the proceedings at the meeting. In the electric supply industry, there is a superabundance of opinion on all the current electrical topics of the day; and where a few folk are gathered together in the name of the industry, there each one must express his well-known unchangeable views—sometimes, we are assured by one veracious electrical recorder, in a "long-winded" manner. Some of the members are municipal councillors; and they come from excellent schools in the matters of verbosity and a liberal conceit, though it is something to be thankful for that all do not get affected with these undesirable qualities. However, with all the talk, there is no getting nearer a common agreement on matters of policy.

In this one meeting, we have a good example of the frailty of human judgment. We have the President (Mr. S. L. Pearce, the Electrical Engineer of Manchester) speaking very well and to the point on the matter of a sounder financial policy in respect of renewals and depreciation. But, on the other hand, he believes the majority of power tariffs extant are remunerative, "although in certain cases they may have involved some remission in the fixed charges to large powers users." Then the Lord Mayor of Manchester thinks more of aids for the rates, and so do a majority of the councillors, than of depreciation of plant. So all through the proceedings there were these contrarieties of opinion on questions of policy. Notwithstanding their position as municipal servants, most gas and electrical engineers in public employ can claim to be as ardent at heart (though the tongue sometimes has to give expression to what the heart does not feel) in regard to proper provision being made for depreciation and renewals while a subject is deteriorating as any technical official in company employ, and as strongly opposed to the principle of taking profits from a concern in aid of the rates, instead of giving the ratepayers the cheapest possible service. Mr. Pearce holds that money appropriated to the rates should be utilized in advancing the sounder financial policy that he has in mind—a policy providing more for depreciation and renewals and lower prices. That the views of councillors, generally speaking, do not incline in the same direction as those of the President, is due in part to the facts that the ease of borrowing dulls their perception as to the necessities of such concerns as these, that the magnitude and diversity of the considerations affecting such undertakings are beyond their comprehension, and that they prefer their acts to be obtrusive rather than otherwise. However, the Gas Department of Manchester and the Chairman (Alderman Gibson) may count upon Mr. Pearce's moral support in trying to get relief for the Gas Department from that incubus of £50,000 to £60,000 which a tyrannical Council compel the gas supply to bear in order that the rates may be relieved, and particularly the rates paid by the largest electricity consumers. The tendency is for rate relief from trading undertakings to grow; and in the face of the profit-grasping section of the City Council, Mr. Pearce makes no secret of his satisfaction that the House of Lords has recently commenced checking that tendency by imposing a 1 per cent. limitation upon Salford in the matter of the profits that may be drawn from the borough gas undertaking in aid of the rates. The Salford councillors, who are not of the way of thinking of the Electrical Engineer of the Manchester Corporation, are in a state of great torment; for, as Mr. Pearce points out, the difference—and the Salford councillors have weighed this difference—between limitation and freedom is as between £6000 and £28,000 per annum. We do admire Mr. Pearce's courage in giving utterance in Manchester to the call to arms in resisting the growing tendency of profit appropriation in aid of the rates as being detrimental to the best interests of the trading concerns.

Then we come to a point on which there is a little uncertainty as to the soundness of this apostle of sounder electrical finance. There is a distinct expansion of view in the electrical industry that it is to power supply chiefly that the industry will in future have to look for increased sales and substantial growth; and an equally expanding view is that the metallic filament lamp has its limits severely defined for promoting consumption. But while Mr. Pearce warns all whom it may concern that it is of supreme importance to consider the power question in all its bearings, and be certain that the financial aspect is sound, and not likely to lead an undertaking into a critical condition, he is not keenly impressed by the argument of the critics that many of the power tariffs are unremunerative, and that the present deficits on power sales are masked by the big surplus on lighting sales. On the contrary, as already stated, he believes the majority of power tariffs are remunerative, "although in certain cases they may have involved some remission in the fixed charges to large power users." That is weak and evasive, coming from the Electrical Engineer of the Manchester Corporation, and from a pleader for sounder finance. Supposing there were no units sold for lighting, and that the total units now sold by (say) the Manchester undertaking were under the power tariff, would the tariff then be remunerative? If not, why not, if the smaller number of power units are remunerative? These being "remunerative," the power business should be profitable without the lighting load. If the prices charged for power (standing alone) can be proved to be remunerative, then why the excitement over, and objection to, the request of ratepayers that the preferential terms granted to large users of electricity should be disclosed? There should clearly be prompt willingness to comply with the request. We hear much about electricity concerns being the property of the ratepayers; we also hear, rather more frequently and conspicuously than is good or pardonable, that the less information the ratepayers receive as to the conduct of the business that is asserted to be their property, the better for the concern. We are not arguing in favour of disclosure; but it is impossible to reconcile the one submission with the other, more particularly when the ratepayers, as at West Ham, have had to pay in hard cash many thousands of pounds to succour an under-rated undertaking supplying electricity to certain power customers at extraordinarily low prices. Mr. Pearce, however, considers that municipalities should not be asked to disclose preferential terms; and naturally there was a chorus of approval from the assembled representatives of municipal electricity supply.

Over this question of cheap units for power, electricity undertakings appear to be between his satanic majesty and the deep sea. The position is shown to be an unpleasant one in a discussion that took place at the meeting on a paper treating of "Cheap Units," by Mr. Councillor A. Sinclair, the Chairman of the Electricity Committee of Swansea. The critics have dealt hardly with Mr. Sinclair, and have flatly told him he does not appreciate the subject upon which he posed as an authority, and that it would be better for him to leave such questions for presentation in future to professional men. This being the position, we will not trouble to follow Mr. Sinclair through his paper. Remember, however, that Mr. Sinclair is Chairman of a Committee managing a municipal electricity concern; and probably, like many others, he gravely accepts the illusion that a high power-load, no matter how obtained, no matter the price, is advantageous to the concern

as a whole. One simple way in which cheap units are obtained for the power consumer is by laying upon the lighting consumer, the full capital costs of the maximum demand on a station—the power consumers reaping the whole of the benefits. There are some central station managers, too, who also skin the costs of everything but the bare charges for generation (sometimes we cannot find the whole of these in material form in the prices that are charged), in their feverish anxiety to secure power customers. But it is interesting to see, from the discussion at the meeting, that the craze for cheap units is not universally approved by the engineers of important central stations, some of whom prefer dealing with figures that they can justify, and over which there is no need for secrecy, nor hysterical protest when asked for the justification. Mr. Lackie, of Glasgow, holds that every electricity consumer should bear his fair share of the capital. Mr. Fedden, of Sheffield, prefers definite prices, and gets them if he can. He finds, we read, that load-factors level up all right at Sheffield, without worrying about individual load-factors. But low as the prices charged are in some places, it is an uncomfortable reflection for station engineers that users are clamouring for lower ones still; and that the intelligence is spreading among manufacturers with good loads that they can do better by isolated plants than by taking energy from the district supply mains. If they can do this, then long-hour and large users of electricity for lighting can do the same. Alderman Higham pressed the point home when he told the meeting that at Accrington it is considered that 0·68d. per unit is too high; that with isolated plant he is himself working at 0·34d. per kilowatt-hour; and that, until the town suppliers can offer something better than this to the millowners, they need not hope for their business. Mr. E. E. Hoadley, the Electrical Engineer of Maidstone, agrees that prices for power are "far too high," and that 1d. per unit is hopeless even in the south. If these expressions of opinion and statements of fact may be taken as omens, with the metallic filament lamps gnawing at the lighting revenue, the prospects of many undertakings must be becoming more and more lugubrious.

The subject-matter before the meeting would not have been complete without a paper, and some references in the presidential address, to the metallic filament lamp. All electrical men think or try to believe, or make believe in their public talk, that the metallic filament lamp is eventually going to be a blessing to the electrical industry. They would be able to speak with more confidence if they could command a higher price for power (which they cannot do), and if for a given sum electricity could offer the same value in B.Th.U's. as solid and gaseous fuel (which it cannot do). The stations that are affected most by the new lamps are those that have little or no day load; and the managers of those stations are the ones who cannot look so complacently and cheerfully upon the effects of the new lamps as their more fortunate brethren. Even the latter are not agreed as to whether the worst effect of the lamps has been experienced. Mr. Pearce inclines to the belief that it has been; Mr. Fedden, of Sheffield, that it has yet to come. The raising of prices for lighting is deprecated; cheaper forms of wiring to gain new custom are forced on attention with a vigour suggestive of snatching at the last straw. Mr. Hoadley was the writer of the paper on the subject read at the meeting; and he does not think matters electrical are going to be very rosy in residential districts during the next few years. He makes the suggestion that heating and cooking should be pushed; but in the accounts of his paper before us, we fail to find that he gives any information as to the extent that the pushing has induced the people of Maidstone to adopt electricity for these purposes. It is hard to live on expectation; but he bids all be of good cheer, and matters will right themselves, though the lane may be long to that happy state. More freedom is, he believes, required. Electricity suppliers always appear to us to have a fair share of that desirable condition; and it rather too frequently imposes its existence upon attention in the shape of deficits in municipal supply accounts, and in other ways. He does not like municipal authorities to be tied down to what he choses to term "silly restrictions;" nor does he like to have authorities competing with gas companies "spied upon" by the officials of those companies at every step to see that the restrictions are not broken. Mr. Hoadley forgets that gas companies are under restrictions—some silly, some otherwise; and that the local authorities (the gas companies' competitors in business) are charged with the duty of seeing that the companies comply with the law. What a silly, anomalous, and monstrous condition of things! The gas companies, in their own defence, have to be ever on the alert to see that they are not placed to any additional disadvantage by the municipality supervising their affairs, and competing with them. Already gas companies are at a disadvantage in this matter; and they do not want to be in a worse position. If Mr. Hoadley were in their shoes, he would persistently practice what he choses to call spying, but which we call being wide awake to one's own interests. And at the present, one particular direction in which gas companies have to keep a sharp look-out is that of public lighting, in which an immense amount of unfairness to both gas companies and ratepayers, is being perpetrated in the so-called interests of the electricity undertaking, and by the aid of the untruth consistently promulgated by a number of electrical engineers and the electrical press, that the metallic filament lamp costs less, and is more efficient for street lighting, than modern incandescent gas-burners.

The depreciating effect on the revenue of electricity concerns that is being brought about by the metallic filament lamp was illustrated during the discussion on Mr. Hoadley's paper, but perhaps most strikingly by Mr. Fedden. Since the advent of the lamp, the lighting-load revenue at Sheffield has diminished by £4000, although only 5000 200-volt, 10,000 100-volt, 420 50-volt, and 144 25-volt lamps have been installed—a very small percentage of the total. To make up for one consumer changing his lamps, Mr. Fedden reckons that three new consumers of a similar demand are necessary—two to make up the revenue, and a third to cover the charges. In regard to heating and cooking, in Sheffield the problem of cheap gas faces the Electricity Department; and, although a canvasser goes round with all kinds of accessories, it is acknowledged to be very uphill work for electricity. Mr. Fedden agrees, however, that the new lamp may be a blessing in disguise. Already it has saved a number of his consumers from going back to gas through the blackening of carbon lamps. The position might therefore have been worse than it is.

NOTES FROM WESTMINSTER.

Opposed private measures are scarce now; and just lately proceedings before Select Committees have been of a comparatively small and scrappy nature. The past week saw nothing in the House of Commons rooms but unopposed gas measures. We are, however, promised one in the Alliance and Dublin Consumers' Gas Bill, which comes before a Committee commencing their sittings to-day.

Dublin Once More.

The opponents are hoping to do better in the Lower House than they did in the Lords. They will find in Sir Luke White a Chairman who has already done some excellent work in that capacity. Certain of the witnesses will rejoice in having in Sir Luke a Chairman somewhat different from the noble Lord who presided over the Committee before whom the Bill came in the Upper House. Names could be put to witnesses who will not at all regret the change; and who may hope to cut better figures before Sir Luke than the sorry ones they made before Lord Ludlow. But it may be expected that there will be the same threadbare tale told to the Committee in regard to the evils wrought by the "Metropolitan" No. 2 burner and lower illuminating grade gas. But the Committee will have no difficulty in appreciating and setting aside the fallacies so conclusively rebutted by an extensive practical experience in numerous gas-supply areas. Nor are they likely to reject—any more than other Parliamentary Committees have done—the recommendations of the Departmental Committee of the Board of Trade, and the consistent practice of Parliament in this matter now over several sessions.

Purchase.

The Bills seeking powers for gas-works purchase are going through without much trouble between the parties this session. There have been little struggles; but not any of much moment. Within the past few days, the Lisburn Bill has been before the Local Legislation Committee; but there was no opposition, and the Bill goes forward. It will be remembered that the session started with Bills promoted by both the Council and the Company. An agreement, however, was arrived at; and the Company withdrew their Bill, allowing that of the Council to peacefully proceed. On the question of purchase, mention was recently made of the success of the Prestatyn Bill, proposing the purchase of the small private gas-supplying concern in the district. There is not likely to be further opposition on the part of the owners; Counsel having appeared for them on clauses. But in connection with that appearance, it must be said we do not think that the Local Legislation Committee did justice in rejecting the suggestion of Counsel for the owners that, unless the purchase was completed within six months after the publication of the award, the powers of purchase under the Act should lapse. That was absolutely fair. It is not good for the gas-works or the gas consumers that uncertainty should be without limit.

Provisional Orders Confirmation.

Quite a long string of Provisional Orders have been before the Unopposed Bills Committee in Confirmation Bills. Nothing of importance has arisen in connection with them. But there are one or two interesting points that may be noted. The Bideford Gas Company appear to have been so successful that they have accumulated an undivided balance amounting, for a small Company like this, to the large sum of £7000. This is too much; the limit nowadays imposed by Parliament is the equivalent of a year's requirement for dividend. The result is that the Board of Trade have arranged for the sum to be dispersed, or rather all but £1200, which is to go to a Special Purposes Fund. The balance is to be distributed among the consumers of Bideford within the next six years, by a gradual lowering of the price of gas. The Bideford gas consumers are to be congratulated over this windfall. In connection with the Compstall Order, objection has been raised to a clause providing that, in addition to 10 per cent. dividends that may be paid in any year, all surplus of profits remaining may be utilized in (if deficiencies exist) making up dividends of previous years that have fallen below 10 per cent. Precedents are to be consulted before the Committee give their decision. It ought not to have been difficult to have produced without delay precedents referring to this matter. Most of the other Orders dealt with capital, land, prices, illuminating power, and the other commonplaces of modern gas legislation.

EXAMINATIONS IN "GAS ENGINEERING" AND "GAS SUPPLY."

Pass Lists.

The Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) has issued the pass lists in connection with the recent examinations in "Gas Engineering" and "Gas Supply."

EXAMINATIONS IN "GAS ENGINEERING."

The candidates who satisfied the Examiner (Mr. W. Doig Gibb, of Newcastle-on-Tyne) numbered 173—viz., 26 First-Class Honours, 47 Second-Class Honours; 40 First-Class Ordinary Grade, 60 Second-Class Ordinary Grade. The names are as follows:—

Honours Grade.

First Class.

Bamber, G. A.	Higgins, F.	Rendle, C. F. W.	Stewart, E. G.
Berry, A.	Hole, S.	Rice, G. H.	Tooby, C. F.
Bradshaw, J. R.	Howie, W. A.	Robert, H. E.	Wheeler, P.
Cheal, A. C.	Jones, G. B.	Robertson, R.	Wootten, E. T.
Chester, R. P.	Lang, J.	Rogers, H. B.	Wyatt, A. R.
Franks, J. W.	Moore, D. G.	Seymour, C. C.	
Griggs, A. R.	Potts, P. C.	Staley, R.	

Second Class.

Ambler, F. G.	Cockburn, C. R.	Marland, P.	Seaton, A. I.
Barraclough, A.V.	Cox, G. F.	Mattey, H. S.	Shepherd, C. E.
Batt, F.	Davies, D. H.	Metter, G. H.	Smith, B. F.
Blair, W.	Dean, F.	Monk, W.	Sutcliffe, J. G.
Bosher, G. H.	Diamond, C.	Moore, E. S.	Taylor, G.
Brewer, P. P.	Dobson, N.	Nice, A. J. N.	Townsend, H.
Briggs, J. C.	Hartley, D.	Pacey, S. O.	Watson, A. T.
Brown, J.	Haynes, H.	Park, J.	Wellard, L. E.
Brown, J. T.	Holland, E. L.	Porteus, W. V.	Weller, F. H.
Caldecott, F. W.	Jolliffe, W. E.	Ranft, J. H.	Wild, W.
Carter, W.	Kennington, J.	Ruggles, F. M.	Woodward, H.
Clarkson, H.	Lawton, C. L.	Scaife, F. L.	

Ordinary Grade.

First Class.

Ault, W. S.	Eastwood, A. I.	May, H. V.	Smith, M. L.
Barclay, W.	Elcock, F.	Muir, A. R.	Strickland, C. C.
Belton, C. M'D.	Firth, H.	Norris, W.	Sumner, A. W.
Berry, A. G. V.	Giles, A. E.	Oughton, E. L.	Taylor, F.
Bramwell, W. H.	Hill, A.	Ritchie, D.	Trickett, A. B.
Bryan, W. S.	Hodder, H. J.	Robinson, A. E.	Waterfield, E. W.
Bullen, A. E.	Jackson, G. J. F.	Robinson, F. C.	Whitehead, S. E.
Coombs, H. A.	Jenkins, E. K.	Ruffhead, A. E.	Whiting, W. H.
Cross, D. C.	Mansfield, C. J.	Skinner, F. N.	Wilkinson, W.
Dunn, J. W.	Marsden, A.	Smith, H. C.	Wright, E. H.

Second Class.

Bezant, B. P.	Freeman, T.	Mansell, H. L.	Smallman, S.
Birks, C. D.	Frisch, G.	Marsh, R. G	Smart, J.
Bolton, W.	Gladwyn, S. C.	M'Cawley, J. J.	Smith, J. C.
Brown, J. W.	Green, J.	Newby, H.	Sutherland, D.
Burke, E.	Hall, T.	Noden, T. J.	Tayleur, G.
Cansino, J. H.	Halstead, P.	Owen, A. E.	Templeton, W.
Cattell, W. H.	Hardy, F. A.	Parsons, B. F.	Thompson, J. W.
Clark, W. J.	Hayes, R. G.	Pepper, G. J.	Walker, J.
Coles, A. W.	Henderson, J.	Philpot, H. J.	Watson, W. J.
Dawson, S. C.	Hughes, T.	Poole, J. G.	Webb, F. S.
England, A. A.	Kimber, R.	Quantrill, E. A.	Webster, H.
Farrar, E. K.	Kwoh, Sce-Kwain	Rice, R.	Williams, S. J. D.
Ferguson, G S.	Longman, C. H.B.	Roy, B.	Willsmer, N.
Fletcher, W.	Mackie, A.	Savage, W. J.	Winslow, A. D.
Floyd, J.	Mann, H. C.	Searle, J. A.	Yates, A. F.

EXAMINATIONS IN "GAS SUPPLY."

In this section, the Examiner (Mr. J. H. Brearley, of Longwood) passed the papers of 191 candidates—viz., 20 First-Class Honours, 32 Second-Class Honours; 58 First-Class Ordinary Grade, 81 Second-Class Ordinary Grade. The names are as follows:—

Honours Grade.

First Class.

Bell, B. J.	Jones, H.	Reed, J. L.	Staley, R.
Craggs, E. F.	Lamprey, R. H. B.	Rice, G. H.	Staniforth, H.
Durward, E. S.	Morgan, H. E.	Rogers, R. J.	Stewart, E. G.
Hartley, D.	Nicholl, J. W.	Sainter, E.	Sumner, A. W.
Horrocks, H.	Quantrill, E. A.	Singleton, H.	Vere, M. C.

Second Class.

Ablett, E.	Elliott, G. H.	Lung, J.	Simmons, A.
Batt, W.	Gadsby, G. S.	Pacey, S. O.	Stapleton, C.
Bedford, W.	Gilbert, E. W.	Pawson, E. G.	Stevens, A. S.
Broadbent, A.	Grogono, W.	Payne, W. E.	Thurley, C. A.
Browne, P. E.	Holdsworth, C. E.	Pullar, J. J.	Townsend, C. V
Chapman, L.	Hoult, H. K.	Ranft, J. H.	Watson, S.
Clark, A. A.	Kelley, H.	Robinson, H.	Wellard, L. E.
Cotton, J.	Kerdel, H. L.	Rogerson, W.	Winslow, G.

Ordinary Grade.

First Class.

Ault, W. S.	Cattell, W. H.	Highmore, J. G.	May, H. V.
Balsom, S. H.	Caudwell, F.	Hill, A.	Murray, A. J.
Bamforth, F.	Chandler, S. B.	Hodder, H. J.	Musgrove, S. T. S.
Barber, W. E.	Cross, D. C.	Hoyles, L. J.	Pepper, G. J.
Batty, T. E.	Dean, F.	Hughes, G. H. G.	Poole, J. G.
Beal, C. F.	Elcock, F.	Kennington, J.	Roberts, H. E.
Behennor, R. J.	Evans, O.	Lawrence, R. H.	Robson, D. E.
Berry, E. J.	Fagan, E. J.	Lawson, W. A.	Rosevear, C. E.
Birks, C. D.	Freeman, T.	Leigh, F.	Thomas, O.
Bray, S.	Green, S.	Lloyd, A. E.	Twist, G.
Briggs, F. C.	Harding, H. J.	Lumb, A.	Westbrook, W. L.
Briggs, J. C.	Haynes, J. T.	Lupton, J.	Whitehouse, A. G.
Bromage, W. H.	Hazeldine, W. A.	Luxon, R. G.	Wyatt, A. R.
Bullen, A. E.	Hazell, W. B.	Mackie, A.	
Burgess, H.	Helden, R. E.	Marsh, R. G.	

Second Class.

Arnold, P. A.	Eastwood, A. I.	Loftus, L.	Stone, E. W.
Asquith, W.	Everitt, A. E. S.	Mansell, H. L.	Taylor, G.
Bate, W.	Featherstone, E.	Moore, H.	Templeton, W.
Beal, H.	Fiddes, H. F.	Morris, F. W.	Thomas, J.
Bellamy, B.	Gorwyn, C. L.	Munro, J. R.	Thompson, J. W.
Bolt, E.	Greaves, H. J.	Noon, E. H.	Toyne, H.
Bowden, W.	Hardy, F. A.	Offer, H.	Trist, C. J. S.
Brady, W. J.	Hartley, H.	Owen, H. W.	Vaughan, W. G.
Broomhall, W. J.	Hawdon, A.	Oxley, W. B.	Walling, S.
Buckley, A.	Heath, J. R.	Page, E. J.	Walters, B. H.
Buckley, J. E.	Henderson, J.	Peel, R. V.	Ward, R. E.
Burke, E.	Hoare, A. W.	Pierce, E. J. J.	Watson, W. J.
Clark, F.	Holdroyd, G.	Ravenhill, L.	Webb, F. S.
Clarkson, H.	Holloway, R. C.	Roberts, A. B.	Williams, A. T.
Cooke, A.	Horton, A. E.	Rogers, R. E.	Williams, S. D.
Cotton, H. F.	Jolliffe, W. E.	Rudge, C. A.	Willison, H.
Cowley, E.	Kershaw, T.	Shepherd, D.	Willmer, H. W.
Cowley, W. A.	Lake, S. L.	Siddle, W.	Winslow, A. D.
Cutler, W. V.	Langford, C. W.	Simmons, S. W.	
Dean, H. W.	Lea, H. W.	Skinner, F. N.	
Duncan, G. F.	Lloyd, E.	Stevens, B. J.	

ELECTRIC LIGHT AND EYESIGHT.

It may be interesting to put on record a few statements on this subject, collected by Sir Joseph A. Bellamy, the Chairman of the Plymouth Gas Company, in view of his recent speech to the shareholders—see last week's "Journal," p. 984—although some (if not all) of the extracts he read have already found a place in our columns.

As far back as the 1905 Congress of the Royal Institute of Public Health, Dr. Allan Wilson said that his experience had proved to him that electric light did a large amount of serious harm to the eyes.

On Nov. 26, 1904, there appeared in the "Lancet" the following remark: "For some not very clear reason, the light of the incandescent electric lamp seems to be wearying—taxing the muscles of accommodation of the eye; and a good many people complain that reading by the electric lamp gives rise to headache."

On March 6, 1906, the same paper reported Mr. I. B. Marks, the President of the American Illuminating Engineering Society, as having declared that "the glare caused by the modern system of lighting streets and buildings with powerful electric arc lights is largely responsible for the admitted increase in defective eyesight."

Last year Dr. Samuel Rideal, F.I.C., in the course of his paper on "The Hygienic Values of Gas and Electric Lighting," said: Mental fatigue was tested by the setting of sums at the beginning and at the end of each evening's investigation. There appeared to be less mental fatigue, on the whole, in the gas-lighted room. The effect on the eye of the two modes of lighting was carefully investigated, though it was found necessary to limit the inquiry to tests of eye-fatigue. The tests showed that the sensitiveness of the eye to light as measured by the perception test, diminished markedly under the electric light; but not at all under gas light. The orbicular muscle tests showed that the power of co-ordinating and using the motor muscles of the eyeball diminished to a greater extent under electric than under gas light. The ciliary muscles of the eye also were proved to be more accommodative after three hours gas lighting than after the same period of electric lighting. The retinal test also showed that the optic nerve or centre remained more susceptible when gas was the illuminant. Thus gas had the advantage under all the tests; and all the results pointed strongly to the conclusion that, as used in these rooms, gas lighting was less fatiguing to the eye than electric lighting.

Blowpipe Flame.—It is reported in a recent issue of the "Frankfurt Gazette" that Mr. Harris, an American inventor in Cleveland, has succeeded in producing a flame by the combined use of oxygen and acetylene gases, of exceptionally high temperature. By its use he claims to have made good welds in aluminium, and also that he can in one minute pierce steel plates 2 inches thick. A 12-inch block of steel was cut through in ten minutes—a work which would have required 20 hours in the usual way.

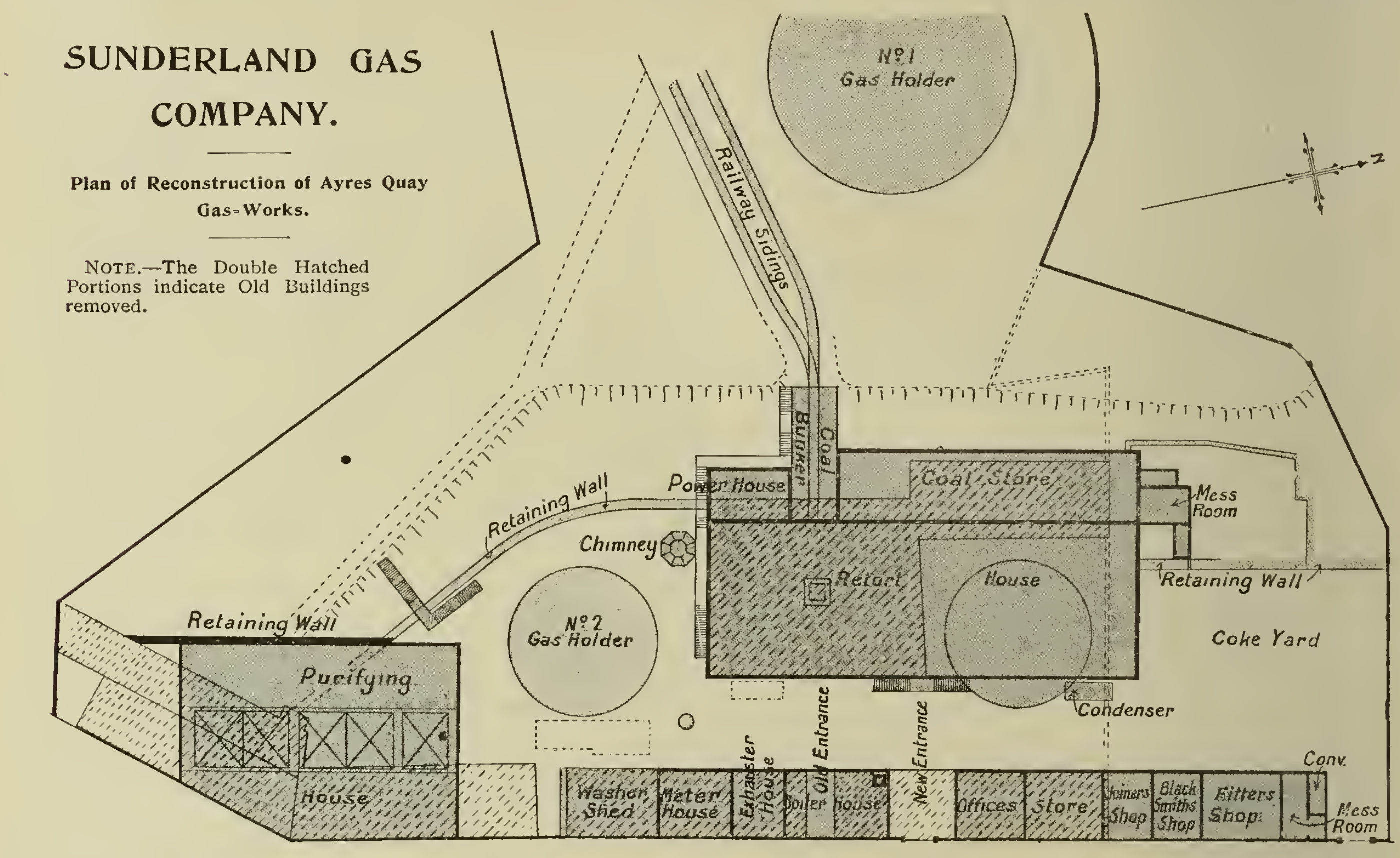
RECONSTRUCTION OF THE AYRES QUAY GAS-WORKS AT SUNDERLAND.

The site occupied by the Ayres Quay station of the Sunderland Gas Company is not one that gives the engineer much choice in the matter of the disposition of his plant. It is an irregular piece of ground, with a long frontage, a shallow depth from front to back, and at the back the ground rises steeply to a height of about 50 feet above the yard-level. The extent of the site is some 5 acres; so that it will be agreed that, with such a piece of ground to deal with, the engineer finds himself much circumscribed. It is really an extraordinary site. It has its advantages; but it has also its distinct disadvantages. However, the making of the best of his conditions is the work of the engineer; and Mr. C. Dru Drury, the Engineer of the Company, was occupied some months ago in the task of designing works for this particular station of greater productive power and more economical in operation, to take the place of those then existing. The works were of a period in origin somewhat distantly removed from the present—1847—and their capacity was only ½ million cubic feet per day. The retort-house was small, the retorts were small, and the remainder of the plant was of corresponding type. To raise the productive power of the works from ½ to 1½ million cubic feet was the objective the Gas Company had in view; and, by taking in an additional piece of ground at one end of the site, excavating from the hill at the rear, and building up a new retaining-wall where required, this purpose has been accomplished; and the new works are now within a short period of being completed—the whole of the old ones having disappeared save for the two gasholders, the larger of which crowns the hill, while the other is at yard-level. In the plan of the works, the double hatched portions indicate the ground occupied by buildings of the old works; and the remainder represents the amount by which the new buildings are larger than the old ones.

The whole of the buildings are new; and they are all built principally of local bricks, with blue bricks in the jambs of the archways and other members of the structures. The general design is pleasing; and in keeping is the fine high panelled wall forming the long front boundary of the works in Wellington Lane. A large new entrance to the works has been made. Just central to the entrance stands the new retort-house; while immediately to the right and left of the entrance, backing on to the street boundary wall, are the offices, stores, and shops, together with the various plant houses, to be more specifically described later. Farther to the left is the purifier ground.

The Retort-House and Adjoining Buildings.

The retort-house is the central feature of the new works; and more particularly is interest directed to it, seeing that it is the first house in the British Isles in which has been, or is being, erected a bench of Dessau vertical retorts. Thus the new Ayres Quay works will be distinguished and unique in this country in that they will be the first to be absolutely dependent upon vertical retorts for their gas-producing power. For what historical interest this may have, we put it on record here. At the rear of the retort-house is the coal-store, a large receiving coal-bunker, and a power house. An extension from the retort-house is a mess-room for the men. Taking the superficial area occupied by this block of buildings, it is more than double the size covered before. The rear side of the coal-store and the huge coal-receiving bunker necessitated considerable excavation into the hill, as well as the building of a strong retaining wall, forming the back wall of the coal-store and power house.



SUNDERLAND GAS COMPANY.

Plan of Reconstruction of Ayres Quay Gas-Works.

Note.—The Double Hatched Portions indicate Old Buildings removed.

C. Dru Drury, Engineer.

The retort-house itself was planned of dimensions suitable for any system of carbonization, though, at the time of its design, and the building of the outer walls, Mr. Drury had only in contemplation horizontal or inclined settings. But, as is explained in an earlier article in this issue, events subsequently led to the installation (now well on to completion) of a bench of retorts on the Dessau vertical system. In consequence, the width of the house is more than equal to requirements; but there is this to be said in its favour, that it gives an abundance of freedom on the ground level, both before and behind the bench. Within its walls, the length of the house is 181 ft. 6 in.; its width, 64 feet. The building is in the main of ordinary local bricks; and the contract was carried out by a local firm. The walls are 41 ft. 8 in. high from floor-level to the eaves. The roof has been specially designed to afford ample light and ventilation; and, by adopting a modified Fink truss, extra head-room was gained for the coal-receiving plant of the vertical retort bench. The principals of the roof are 8 ft. 4 in. centres, carrying angle laths of 2 in. by 2 in. by ¼ in. section, and 10½-inch gauge; and upon these the slates are laid—the angle of the roof being 30°. The roof (which formed a separate contract with Messrs. Cutler and Sons) is of light design, and has features that arrest attention. In addition to a central louvre ventilator, there is a continuous open ventilator, 6 ft. in width, on the discharging side of the house; and a skylight with Rendle's glazing, 7 ft. 6 in. in width, running the length of the opposite side to provide light for the operations above the top of the bench. At the centre of the roof, is a strongly framed dormer, to accommodate the coal-elevator head and a coal screen. This dormer is carried upon two special principals, and is also provided with louvres and skylight of ample character. As before remarked, the house has been constructed for the production of 1½ million cubic feet of gas per day, as compared with the ½ million formerly produced, which means the trebling of the output. The chimney shaft is at the southern end of the house. It is a fine piece of structural work, octagonal in form, 130 feet in height.

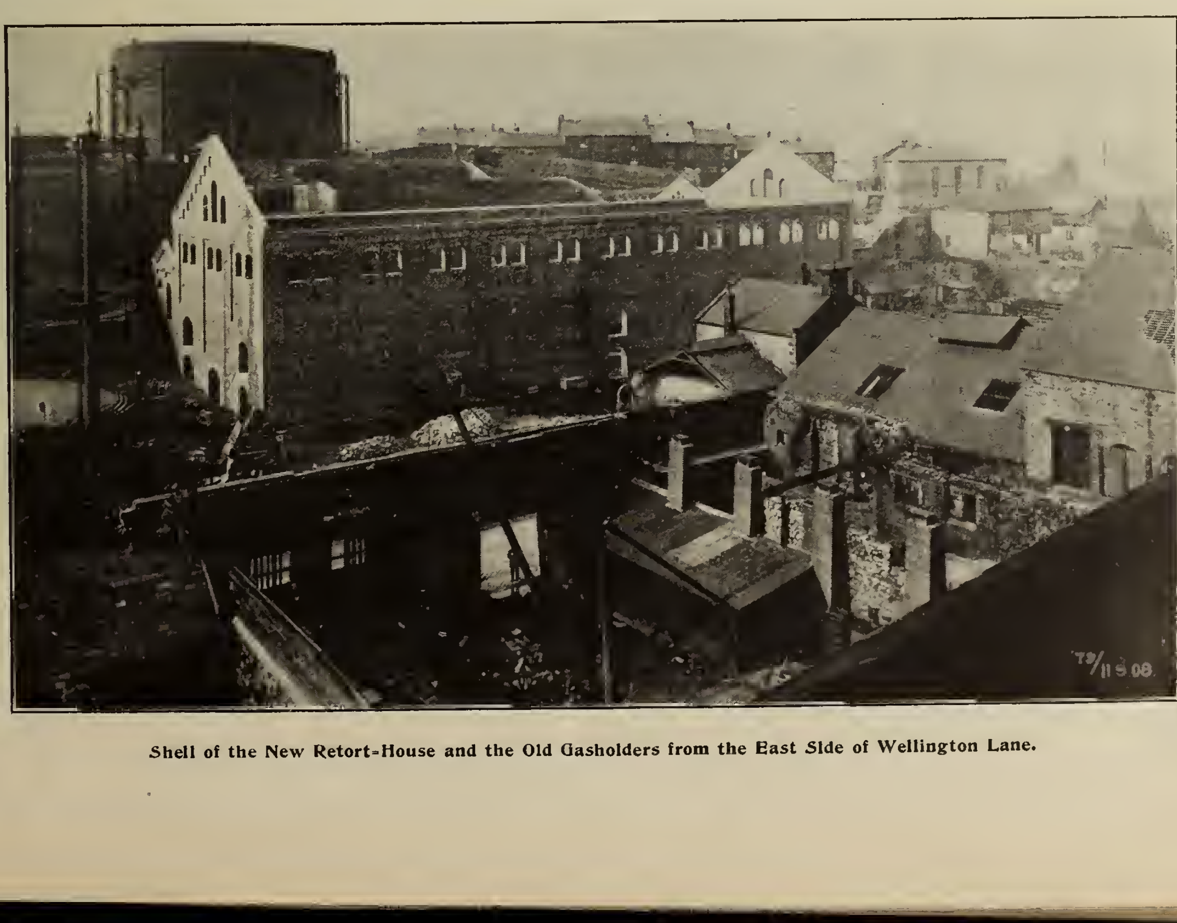
Coal Storage and Delivery—A Ferro-Concrete Receiving Bunker.

With regard to the coal delivery and storage arrangements, the hill at the rear of the site over which runs the works' railway sidings limited the scope of the engineer in drawing his plans; but an inspection of the work carried out shows that he has made good use of the natural conditions of the site to secure the most economical handling of the raw material. The coal-store—extending longitudinally on the rear side of the retort-house from

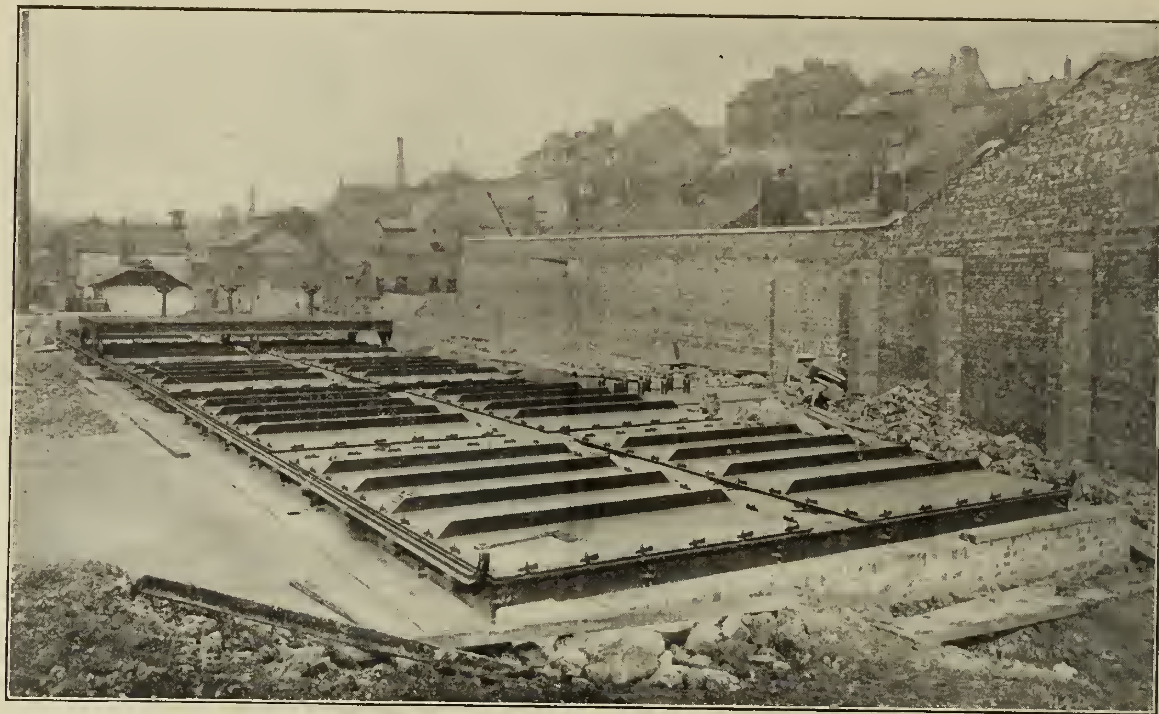
Ayres Quay (Sunderland) Gas-Works—End View of the Retort-House, with Power House and Ferro-Concrete Coal-Bunker.

the large coal-receiving bunker—is 25 ft. 9 in. wide, and 129 ft. long. It has a storage capacity of 1600 tons; and, in all, the storage will be equal to fourteen days' maximum consumption. Mr. Drury is manifestly a believer in plenty of light; and here again we find a part (running lengthwise) of the roof with Rendle glazing, in order to give plenty of light in the store. As a matter of fact, without this top glazing—with the division wall of the retort-house on one side, and the retaining-wall on the other—the store would be ill-lighted. The floor of the store and that of the power house, stands well above the ordinary works' level.

The receiving coal-bunker is worth special mention. It is a massive piece of ferro-concrete work on the Hennebique system, as will be remarked by the side view in one of the photographic reproductions. The bunker has a working capacity of no less than 200 tons. The internal width of the bunker is 14 ft. 3 in., and the top, or deck, is from front to back 48 feet. The floor is an incline (at 40°) running from the top to the bottom, and ending at the entrance to the coal-breaker. The top of the bunker is some 50 feet above the ordinary yard level, and will be covered over by a galvanized iron building on steel framework. The hopper bottom is 7 inches thick; the sloping floor, 6 inches thick; the sides, 4½ inches thick; and the deck, 3½ inches thick—the whole being in reinforced concrete. The bunker is carried on twelve ferro-concrete columns. The incoming railway waggons will be shunted by the engine on the sidings on the hill to the end of the bank, and then hauled by a capstan over the bunker, dropping through bottom doors their contents direct into the coal-bunker. From the bottom the coal can be fed into the coal-breaker by a jigging screen, which bye-passes all small coal; and an automatic feeding gear fixed to the bottom of the hopper gives the regular feed required, and prevents the jigger from choking. The coal passes from the breaker to a band conveyor, which runs in a ferro-concrete tunnel in the stores; and this conveyor will deliver the coal into the boot of the elevator running into the retort-house. The coal-store will be filled by tipping-skips, which run on tracks fixed to the roof principals; and these skips will be filled by shoots fixed to the sides of the ferro-concrete bunker. When it is desired to take coal from store, the breaker in the store will be used; and this will be supplied by an automatic feeder placed in the coal-store floor. The broken coal will then pass down a shoot into the elevator boot. The elevator, breaker, and feeder will be protected by a steel shield having a slide-door in the front, which admits the coal to the jigger. The coal-store breaker will be placed in such a position that, when the slide-doors in the ferro-concrete bunker are opened, the coal will naturally fall through without handling; that part of the store nearest the bunker being filled with coal. The breaker and jigger under the bunker and the band conveyor will be driven by an electric motor placed in the space under the bunker; and the elevator and coal-store breaker, will be driven by a separate motor, placed in the opening for the elevator in the retort-house wall. Clutch gear will be provided, so that the coal-store breaker may be



Shell of the New Retort-House and the Old Gasholders from the East Side of Wellington Lane.



New Purifiers at the Ayres Quay (Sunderland) Gas-Works.

thrown out of gear when the elevator is taking coal direct from the bunker emergency plant. In the event of the coal-handling plant getting out of order, the coal can be taken from the stores through openings in the wall, and fed through shoots which screen the coal; the small coal falling into waggons which are run into the hoist at the end of the house. They can then be lifted to the top of the continuous hoppers over the bench, and run along a light railway, discharging the coal into any part of the hopper. Drawings accompanying the article on the Dessau settings (p. 25) will assist in illustrating this description.

Equipment of the Retort-House—The Dessau Verticals.

The coal-handling plant is equal to about 25 tons per hour; but the part in the retort-house, and the coke-handling plant, are described in the separate article treating specially of the first installation of Dessau vertical retorts in this country, and in this new retort-house at the Ayres Quay works. But it may be mentioned here that the coal-handling plant, together with the coke-hoist for feeding the hopper for supplying the producers of the Dessau settings, has been so designed that the whole of the work, when the retort-house is fully equipped, can be done, if necessary, by the yard men, in an ordinary working day, and thus escape the necessity of night-work in connection with the handling of material. The contractors for the coal and coke handling plant are Messrs. Graham, Morton, and Co., of Leeds.

The Power-House.

In connection with the retort-house plant, Mr. Drury has cast his choice for electrical driving. In the power-house, there will be the generating plant, the central features of which will be two National gas-engines, each of 68 brake horse power, connected direct to a 40 kilowatt dynamo. One set will generate all the current (at 220 volts) required; and the other one will serve as a stand-by. The dynamo and electric plant are by the Sunderland Forge and Engineering Company. The energy, as previously mentioned, will be used for operating the coal and coke handling plant, including the coke-hoist for feeding the coke-bunker over the charging-floor for serving the producers. The other plant—such as the exhausters, the washer-scrubbers, and the pumps—will be driven by steam-engines.

From Condensers Onwards.

Before leaving the retort-house, it may be mentioned that there will be fixed a 10-inch retort-house governor (Cowan type) by Messrs. Parkinson and W. & B. Cowan. Outside the house it is seen that a good coke yard has been provided, in which will be the coke-hoppers, and sorting screen, described in the special article on the vertical retort installation. In front of the retort-house, near the coke yard end, is being erected a Morris and Cutler water-tube condenser, of 1 million cubic feet capacity. Attention is next directed to the long range of buildings to the right and left of the main entrance to the works. The whole of the buildings are 30 feet from front to back. The range that is on the right as the works are entered occupies a total length of 158 ft. 6 in. This range is divided into offices, stores, joiners' shop, blacksmiths' shop, fitters' shop, mess room, &c. The shops are being equipped in a manner to make the works self-reliant for repairing work. The machine tools in the shops will be driven by a gas-engine.

On the left-hand side, as one enters the works, the range of buildings is 139 ft. 6 in. long. Of this length, the boiler-shed occupies 43 ft. 6 in.; the exhauster-house, 22 ft. 9 in.; the meter-house, 30 ft. 9 in.; and the washer-shed, 42 ft. 6 in. The plant will be (excepting the exhausters) in units of 1 million cubic feet; and the first section is now being erected. In the boiler-house, there are two Cornish boilers, 22 feet long by 5 ft. 6 in., fitted with Wilton's breeze furnaces. The boilers are by the Hebburn Boiler Company, Tyneside. In the exhauster-house, there will be two sets of Waller's steam-driven exhausters, each of 80,000 cubic feet per hour. In the washer-shed, there are a Livesey washer by the Whessoe Company and a "Standard" scrubber-washer, each of a million cubic feet capacity. The meter-house contains an 80,000 cubic feet per hour station meter, removed from the Company's Hendon station, and re-erected here by Messrs. Parkinson and Cowan; the drum having been re-sheeted. The governors are by the same firm—one an 18-inch, and one a 12-inch.

The purifiers are in a single range in the open, and are located hard by the buildings just referred to, as seen in the plan; being flanked on either side by covered revivifying-sheds for dealing with the oxide—oxide being the only material that will be employed, and the only material that is required with such a low production of sulphur compounds in the gas from the Dessau vertical retorts. The purifiers are divided into five boxes, with dry seals. The dimensions of each box are 20 ft. by 25 ft. by 6 ft. deep; four working with a Weck centre-valve, and one with ordinary valves. The boxes are all fitted with Spencer's hurdle grids. For lifting the covers, a Hovey crane has been adopted. The purifiers were constructed by the Whessoe Company.

The Gasholders.

The two gasholders are really the only parts of the station that remain of its old equipment. The larger one is situated on the hill at the rear of the works. It is a four-lift holder, of 100 feet diameter. Formerly, it had only three lifts, one of which was rope-guided; and now a second rope-guided lift has been added by Messrs. Ashmore, Benson, Pease, and Co. (making the four). While this work was in hand, the holder was thoroughly overhauled, and the framing stiffened. In its elevated position, the structure is much exposed; but there has been no trouble with the rope-guided lifts. The second holder is at the yard-level—a three-lift one, 60 feet diameter. The storage at the station is altogether only $\frac{3}{4}$ million cubic feet.

An old covered gasholder tank forms the tar and liquor well.

The works' mains are 18-inch, except up to the inlet of the condensers; and to that point they are 20-inch.

The whole of the works—with the exception of the ferro-concrete coal-bunker, and, of course, the bench of Dessau verticals—were designed by Mr. Drury, with the assistance of Mr. H. H. Collett, the Chief Draughtsman, who prepared all the drawings and specifications, and took the photographs which illustrate this and the special article on the Dessau settings. Mr. A. E. Ruffhead has been the Clerk of Works since the commencement of the re-construction in September, 1907.

There is still much to be done to complete the works. But all the plant is now well in hand; and gas making will be in progress in time for next winter's season. There is no doubt that Mr. Drury has made the best possible use of the peculiarly shaped and environed site at his command. For the interest afforded by him on the occasion of an inspection of the work in progress, our thanks are due.

THE FIRST INSTALLATION OF DESSAU VERTICAL RETORTS IN ENGLAND.*

The Ayres Quay gas-works of the Sunderland Gas Company will, in a very few months now, illustrate in a notable manner and degree the truth of the saying that the old order changeth and giveth place to the new; and part of the new here will be on the most modern principles, and be representative of the system that first successfully demonstrated the economy in operation, and the economy expressed in improved quantitative and qualitative results, of the application to the carbonization of coal, for (primarily) gas production, of the natural law of gravitation. The original intention of the designers of the Dessau system of carbonization was to derive from the setting of retorts vertically that economy in working which, *primâ facie*, appeared to them should be obtainable by the utilizing of the weight of the coal for charging, and the weight of the spent charge for discharging, if a proper combination of parts could be devised that would make the whole a workable and an efficient carbonizing plant. The designers of the system worked to better end than that of which they were originally cognizant, or had conceived to be possible. It follows that until the setting was brought in all its features to a working perfection for carbonization, the effects could not be ascertained or measured; and then for the first time we learned that a full charge (which can only be economically obtained in a vertical retort, or a retort set at a sharp angle, or by projection in a horizontal retort) carries with it not only economy in labour, but a high make of gas per ton of coal carbonized, with, according to system, other attendant advantages of which the gas-maker had theretofore been robbed by the high temperatures to which he had had recourse to improve the volume of his gas production and to lower his fuel account. The advantages gained by the former method of high temperature carbonization and comparatively shallow charge were to an extent discounted by the disadvantages coincidently brought into existence. The Dessau vertical retort system showed us that these disadvantages could be

Front View of the Vertical Retort Bench at the Ayres Quay (Sunderland) Gas-Works.

largely and constantly annihilated, and the losses they occasioned retrieved. With the first introduction of the Dessau system into this country, full acknowledgment must be made of what the originators of, and workers on, it have taught us. It is only right to give honour where honour is due; and all the success that the owners of the Dessau system have achieved in introducing it into gas-works on the Continent is their due.

A Bench of Sixty Verticals.

It is, as our readers are aware, a bench of the Dessau vertical settings that is now nearing completion at the Ayres Quay Gas-Works of the Sunderland Gas Company; the Directors having adopted the system on the advice of their Engineer (Mr. C. Dru Drury), which advice, and the general lines of the new works scheme, had the approval of Mr. J. H. Cox, who, with fifty years' faithful service as his record, still retains his office as Secretary and Manager. His interest in all the affairs of the Company remains unabated; and to him all matters of construction and policy are still finally referred. Mr. Cox, by the way, has seen numerous changes within the walls of the manufacturing stations of the Sunderland Gas Company. But that which is now being brought about is the greatest change of all. This first bench of Dessau verticals in England will have a unique advantage. The old works on the Ayres Quay site have been razed to the ground; and very shortly a new complete works will have been brought into being from the plans of Mr. Drury. The only carbonizing plant upon the works for some time to come will be of the Dessau type; and possibly—if working justifies extension—there will be no other form of retort-setting on the works until (if ever) a new order of things supersedes that of which we have now knowledge. This being so, the working results here will, and under British conditions, have perfect independence, and cannot possibly be mixed up with the products of carbonization under any other system. The results obtained under such circumstances will be valuable, indisputably reliable, and reproducible; and the gas profession will await them, from the time the installation is brought into operation in the autumn, with no ordinary interest. This, it should be emphasized, will be the first installation of vertical retorts of any kind in this country at work on the large scale; and the Ayres Quay Gas-Works will be the first in this country

* See also an article on the Ayres Quay Gas-Works of the Sunderland Gas Company, page 22.

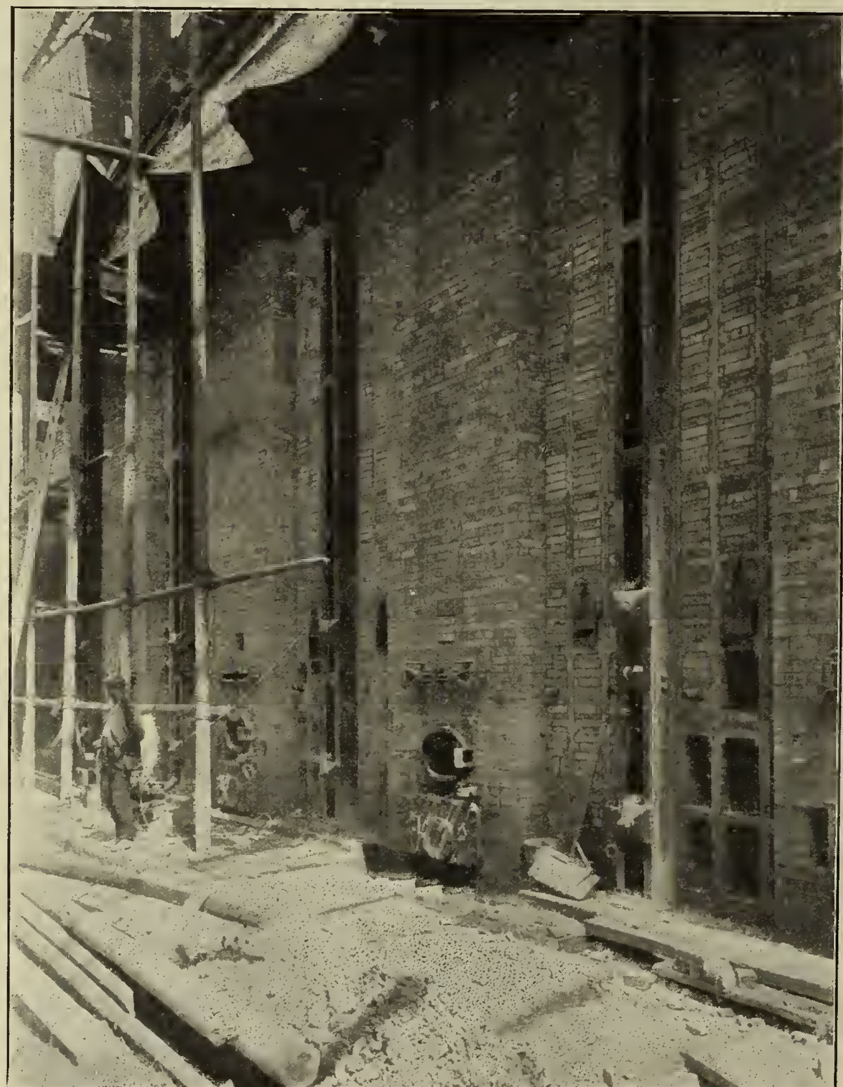
to rely solely upon vertical retorts as the centre and base of its operations.

The New Retort-House.

The new retort-house in which the Dessau bench stands was designed and built for the accommodation of machine-worked horizontal retorts or inclined settings. This in itself is an interesting fact; for it indicates that at the time of design, and of the partial erection of the building, Mr. Drury had not seen anything sufficiently attractive about the results of the working of vertical retorts to justify him entertaining, in the interests of his Company, any revolutionary departure from common retort-house practices. Before, however, it was necessary to equip the house (there being no pressing need owing to the heavy cloud of depression over the local shipbuilding trade), there was opportunity for thoroughly investigating the claims of the Dessau system; and, to cut a long story short, there are now nearing completion six beds of ten 4-metre (13 ft. 1½ in.) retorts, as portrayed in the illustrations, reproduced from photographs taken at different periods during construction. The new house is really more commodious than is requisite for vertical settings; but, as has just been remarked, it was designed for settings that would have required the greater width of building. The consequence is that at both back and front of the bench, there is an amount of spare space, as the work is mainly done on top and below the retorts. But there is no disadvantage in excess space, as it means plenty of freedom for any of the operations attaching to the working of the bench. The internal dimensions of the house are 181 ft. 6 in., by 64 ft. wide; and, in addition to the sixty retorts now being constructed, the building is equal to accommodating an additional five beds of tens, subject, of course, to the experiences with the first six.

Some Particulars of the Vertical Settings.

The ground space occupied by the bench, including the end piers, is 90 ft. 6 in. by 17 ft. 6 in. from back to front. The total height of the bench to the top of the coal-hoppers is 40 ft. 4 in.; and to the top of the bench, or the charging-floor, 21 ft. 6½ in. Between the top of the bench and the bottom of the hoppers, there is working headroom of 9 ft. 7 in. The foundation for the bench is a solid bed of concrete, about 92 feet long by 20 feet wide, with extensions for the main flue and hot-coke conveyor. The buckstays, girders, bracings, and steelwork generally are all of substantial character for their respective purposes. The brickwork of the bench is 90 ft. 6 in. in length and 17 ft. 6 in. wide, and has a height of 21 ft. 6 in. from the floor-level. The width of each bed between the division walls is 13 ft. 2½ in.; and in this space are accommodated ten tapered retorts, each having internal dimensions of 22½ inches by 9 inches at top, and expanding to 27 inches by 13½ inches at bottom—the length being 13 ft. 1½ in. (4 metres). The retorts are constructed in half lengths, and are supported on heavy cast-iron plates, which are in turn carried on a substantial girder framework, with a clear way beneath of about 6 ft. 6 in. This forms a sort of subway under the retorts, and between the lower part of the producers and the front of the bench, as shown in one of the photographs. The front of the subway is open right along the bench, save for the presence of the buckstays. At the back of the bench are the producers, of which there is one to each bed, extending down to the floor-level, with the boiler underneath. Going to the rear, it is seen that all the air-regulating and clinkering-doors are in handy and convenient positions, and that provision has been made for a steam supply to the retorts, should the Engineer desire to supplement his make.



Producer Side of the Vertical Retort Bench at the Ayres Quay (Sunderland) Gas-Works.

The internal construction of the beds is of the type that long and extensive experience on the Continent has shown to be the most appropriate for this form of setting and working. The retort-charging doors are operated in the usual manner; but the bottom discharging-doors are opened and closed by means of gear actuated from a position beyond the bench, as shown by one of the drawings. This is an important feature, as it allows the retorts to be discharged with ease and celerity; and the attendant is protected from any excessive heat.

Coal-Feeding Arrangements.

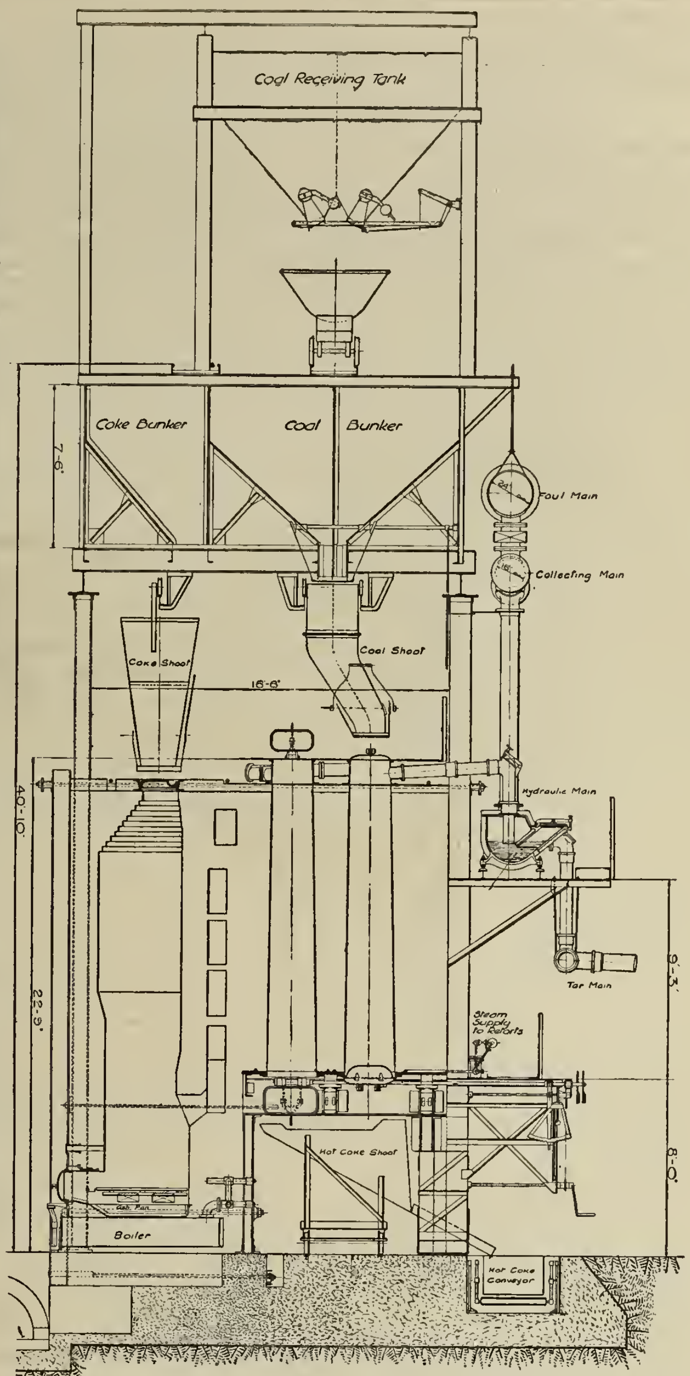
The coal supply for the bench is taken by an elevator either from a large ferro-concrete coal-receiving bunker through a coal-breaker at the foot, or from the store running longitudinally at the rear of the retort-house. In the centre of the roof of the retort-house is a dormer, accommodating the elevator head, as well as a rotary screening-drum. The elevator delivers the coal into this screen; and the material is separated into two sizes—large and small, which are delivered into their respective receiving-hoppers located in the roof above the level of the storage bunkers. The overhead storage bunkers extend the entire length of the bench, and have a capacity equal to 24 hours' supply for the 60 retorts. They are supported on cross girders carried from

the buckstays, and have a central diaphragm dividing them into two equal compartments for the storage of the "large" and the "small" coal. Trolleys, running on a central track, are used for filling both compartments of the bunkers from the receiving hoppers. The trucks are run by hand under the latter, filled by gravitation, and are then discharged sideways into either compartment of the bunkers. The retort-charging shoot (which is fitted with swivel gear by means of which it is rotated to serve either of the two lines of retorts) traverses a rail-track suspended below the bunkers; the shoot being provided with a diaphragm corresponding to the division in the bunker, so that a stream of large and a stream of small coal are simultaneously charged into each retort—thus forming in each two vertical columns of rough and small. This is not considered to be always necessary with the 4-metre verticals; but Mr. Drury decided to adopt the idea (which it will be remembered was first applied by Herr Körting to his 5-metre retorts at Berlin) to be on the safe side in regard to the pressure in the retorts.

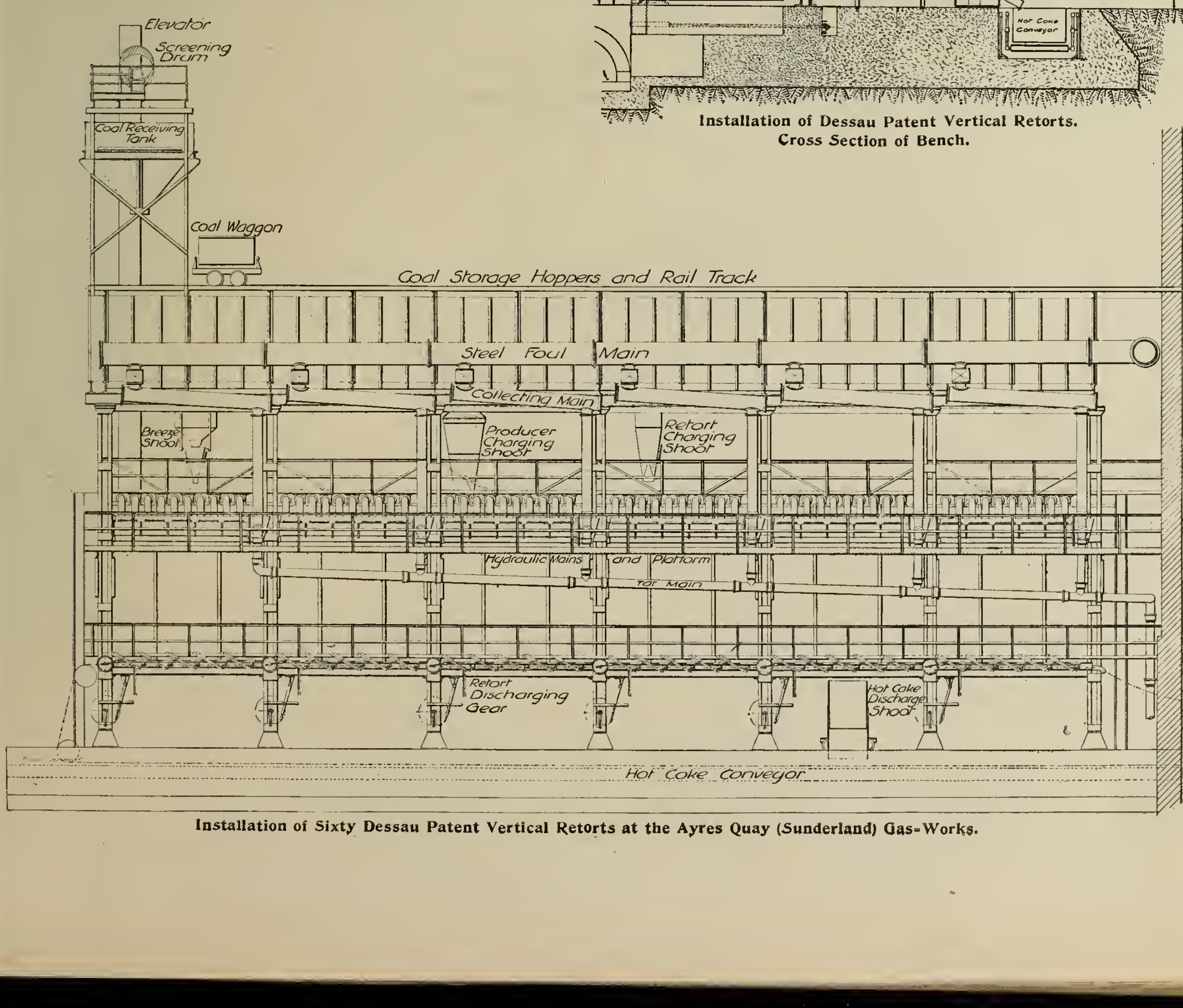
The charge per retort will be 10 to 11 cwt., with two charges per 24 hours; so that the six beds will be about equal to 63 tons per day. Should the working induce the Directors of the Gas Company to erect the further five beds that the house will accommodate, the total quantity of coal the eleven settings will be capable of carbonizing per 24 hours will be 115½ tons, or thereabouts. There may be some question as to why the Company did not adopt the 5-metre (16 ft. 5 in.) retorts, in which the charges are correspondingly greater than in the 4-metre ones as introduced at Sunderland. The reason is that, while we are under illuminating power restrictions in this country, working on the Dessau system, the shorter length retorts will give the better results.

Coke Plant.

The hot coke, as discharged from the retorts, will be received upon a travelling sloping shoot, running on rails under the bench, which shoot will direct the coke into the conveyor carried in a culvert just beyond the front buckstays of the bench. The hot material will be conveyed through a quenching device, and then be delivered up an incline outside the house into an elevated coke-hopper, or through doors in the conveyor trough for stacking in the yard. The portion delivered into the coke-hoppers will be sorted into three sizes—breeze, small, and large, ready for loading for sale or for delivery into tipping trucks, for use in the bench producers. The service of coke to the producers is by means of an electrically driven hoist, which carries the trucks to an overhead track provided on the top of the coke-storage bunkers, which are of similar construction to the coal-bunkers, and have a capacity equal to serving both the present and future duplicate bench with fuel for twelve hours. A mono-rail track extends above the producers; and upon this is carried the coke-charging shoot, which, after being filled by gravitation from the storage bunkers, is traversed to serve any producer as required. There is also a breeze bunker, to contain sufficient breeze for the completed installation of 110 retorts for a period of twelve hours;



Installation of Dessau Patent Vertical Retorts. Cross Section of Bench.



Installation of Sixty Dessau Patent Vertical Retorts at the Ayres Quay (Sunderland) Gas-Works.

a small quantity of breeze being dropped into each retort before the coal charge is introduced.

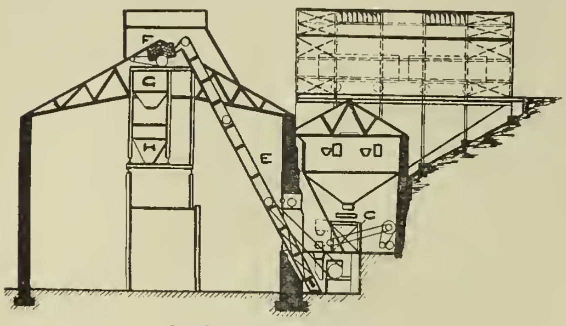
Travel of Gas from the Retorts.

The bench mountings are, as will be seen from the drawings, very simple in character. In the first place, Mr. Drury has incorporated a 10-inch retort-house governor of the Cowan type. Beyond this, it need only be mentioned that the take-off pipes from the mouthpieces are 6 inches in diameter, and are sealed in hydraulic mains of large capacity, each main serving one bed of ten retorts. The hydraulic mains are provided with a longitudinal sealing diaphragm, by means of which a sealed outer chamber is provided, allowing the introduction and withdrawal of the "pitch-pans" without stopping gas making. A separate "pitch-pan" is placed under each dip-pipe; and the tar and liquor overflow is regulated by means of "Drory" valves. From the hydraulic mains the gas passes through 10-inch steel pipes into 16-inch diameter collecting mains; thence into a 24-inch diameter foul main, reduced to 20 inches, extending around the retort-house to the inlet of a Morris and Cutler water-tube condenser, specially designed to deal with the gas produced from this installation.

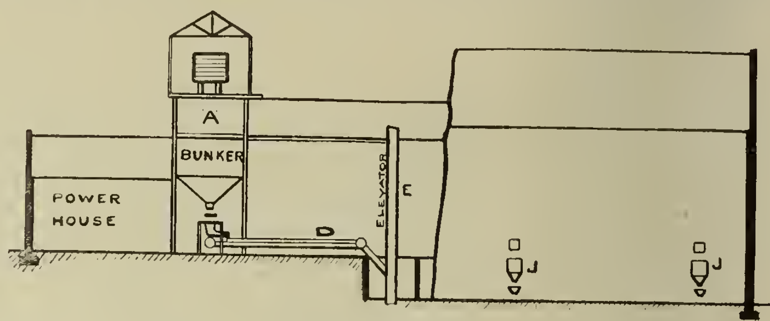
Access to the various parts of the bench is obtained by a series of stairways and platforms of ample and very convenient character.

British Work and Contractors.

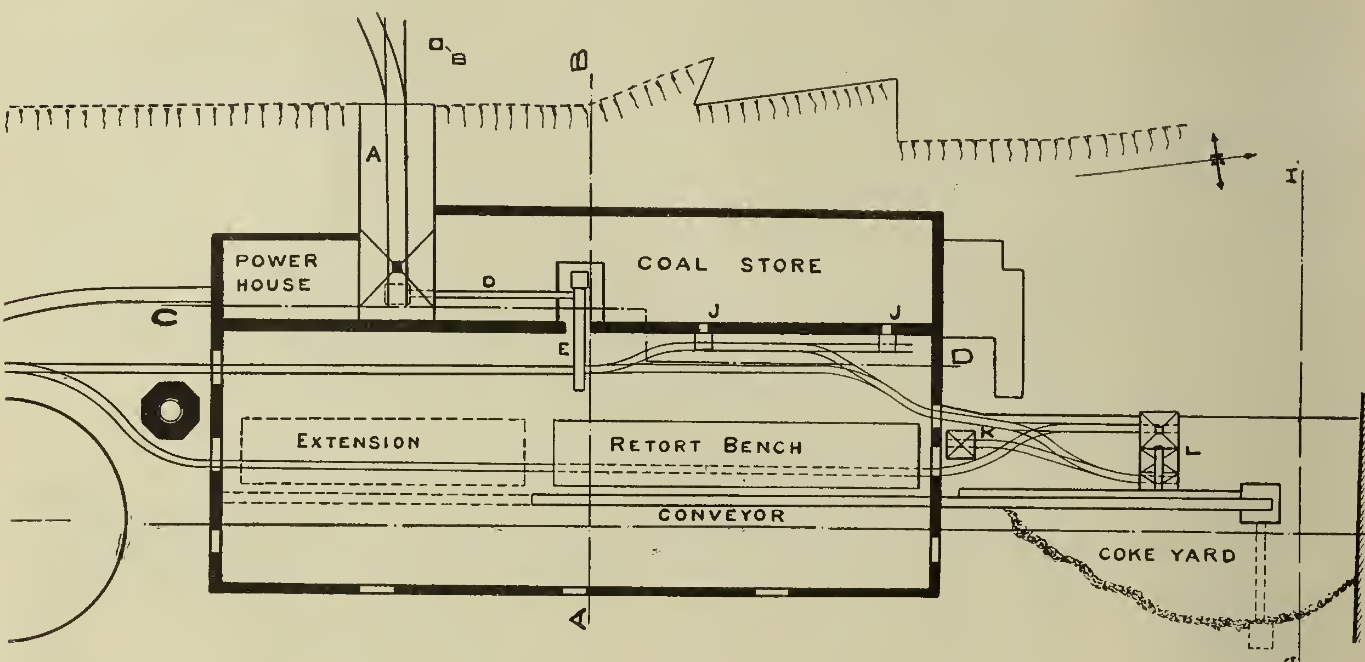
The structural work of the bench is now in the position when a thorough examination can be made of the manner in which it is being carried out. Wherever one looks—whether it be at the steel framing, the brickwork internal and external, the hoppers, &c.—it gives a good impression as to general substantiality, workmanship, and care on the part of the contractors. The contract was let, by the Dessau Company, conjointly to Messrs. Samuel Cutler



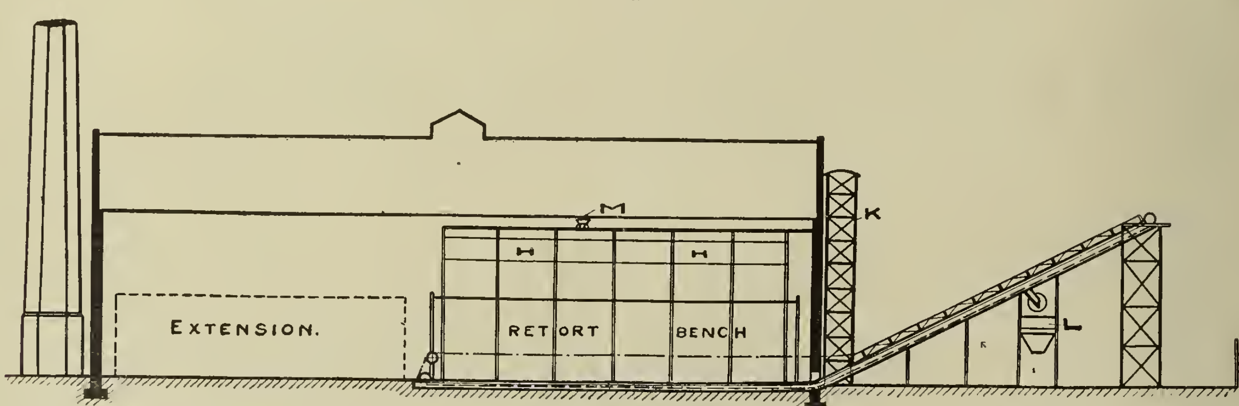
Section on Line A B.



Section on Line C D.



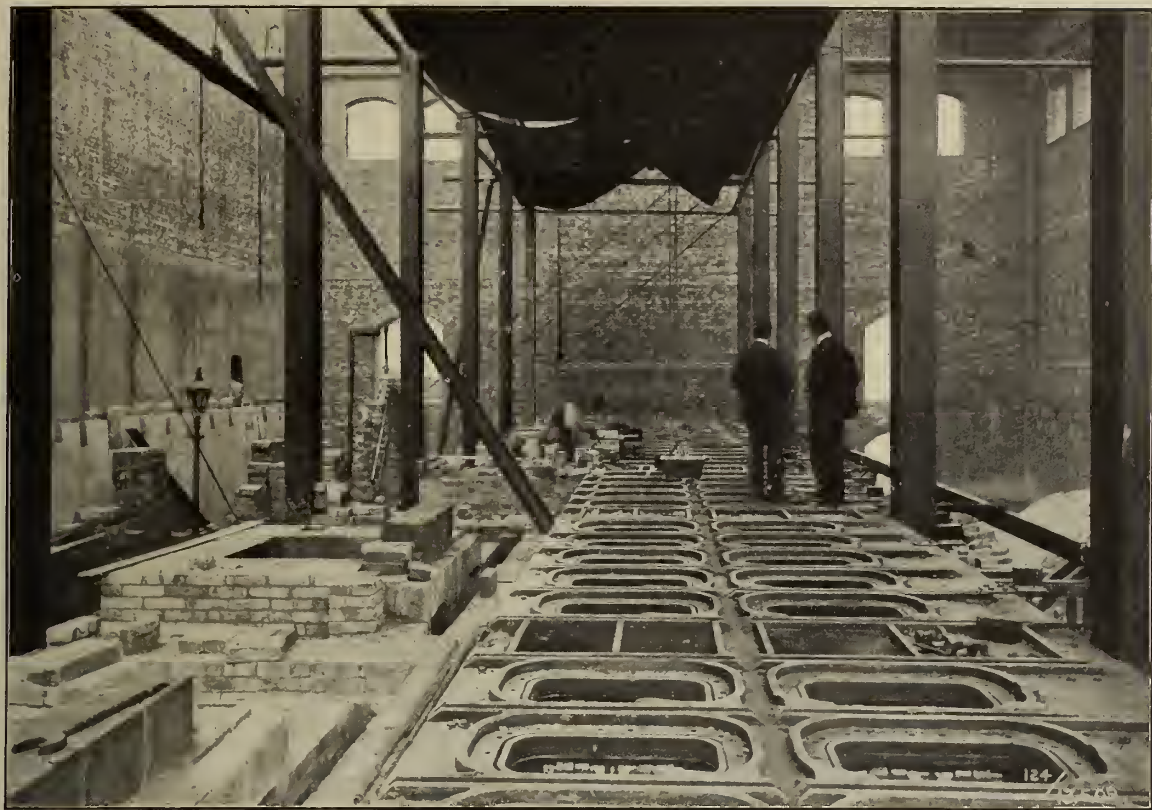
Plan.



Section on the Line E F.

Section on Line G H.

A. Ferro-concrete coal bunker.
B. Capstan.
C. Coal-breaker.
D. Band conveyor.
E. Elevator.
F. Revolving screen.
G. Coal-hopper.
H. Continuous hopper,
J. Emergency shoots.
K. Coke-hoist.
L. Coke-hopper.
M. Waggon.



The Vertical Retort Bench under Construction at the Ayres Quay (Sunderland) Gas-Works.

and Sons, of Millwall, and Messrs. Graham, Morton, and Co., of Leeds—the former being responsible for the steelwork and fittings, the latter for the brickwork of the settings, elevators, conveyors, &c.; while Mr. Charles Hunt, of Westminster, is representing, in the capacity of Consulting Engineer, the owners of the system. It should be mentioned that it was stipulated by the Sunderland Gas Company that the whole of the material should be of British manufacture; but there was the reservation on the part of the Dessau Company that the lower parts of the retorts, and the fire-bricks used in the combustion chambers, should be made by the Stettiner Company, owing to their extended experience with the material required in these positions. But otherwise every part is British made by British labour. The whole of the brickwork of the settings will be finished early this month; so that the bench will be in readiness for use in the coming winter.

It may be of interest to note that the Vertical Gas-Retort Syndicate has been formed for the purpose of constructing retorts upon this system in Great Britain and the Colonies, having offices at No. 17, Victoria Street, S.W.

AN EFFECTIVE INVERTED GAS-FITTING.

In the course of a letter received last week from Mr. Bernard F. Browne, the Engineer of the Primitiva Gas and Electric Light Company of Buenos Ayres, he remarks: You will doubtless have noticed of late how great an advantage our electrical friends are taking from the employment of "Holophane" crystal goods in combination with the tungsten lamp. I have been looking in vain among the British gas-fittings manufacturers' catalogues for a cheap but elegant inverted fitting suitable alike for business houses and private dwellings. It has seemed to me that the advantage of the employment of "Holophane" globes in this connection has been somewhat overlooked. Thinking that such a combination might interest your readers, I am sending a photographic reproduction of a chain-pull combination which we have been employing very successfully in Buenos Ayres. It is of quite simple construction. The combination cock is hidden within the "spun" cups. The whole exterior is nickel-plated, including the burners, while the interior is made up with ⅜-inch barrel. The glassware is "Holophane," made specially for use with the inverted gas-light.

Masonic.—Last Thursday the annual meeting of the Provincial Grand Lodge of Lincolnshire was held at Spilsby, when W. Bro. R. G. Shadbolt was appointed Provincial Junior Grand Warden of the Province by the Right Worshipful Provincial Grand Master, the Earl of Yarborough.

Reduction in Price by the South Metropolitan Gas Company.—In the "Journal" for the 13th of April, it was announced that the South Metropolitan Gas Company intended to reduce their price at Midsummer. At a meeting of the Board last Wednesday, it was decided that the amount of the reduction should be 1d. per 1000 cubic feet; bringing the price down to 2s. 2d.

Less Artificial Lighting.—Cincinnati, Ohio, has adopted the idea of setting the clock one hour ahead during the summer. The new ordinance becomes operative on May 1, 1910, and continues until Oct. 1, 1910. The measure is the first of its kind passed in the United States; and the National Daylight Association, who are fostering the plan, have made preparations to continue work on a larger scale.

LEEDS GAS COMMITTEE & VERTICAL RETORTS.

Report on the Sub-Committee's Visit to the Continent.

The Leeds Gas Committee last Friday had before them the report of a Sub-Committee who, on Nov. 24 last, were appointed "to consider the question of adopting a system of vertical retorts, and, if thought necessary, to obtain information by visiting." The Sub-Committee consisted of the Chairman (Alderman Tetley), the Deputy-Chairman (Councillor Ratcliffe), and Councillors Brown, Hinchliffe, and Ambler. These gentlemen, together with the General Manager (Mr. R. H. Townsley) and Mr. W. B. Leech, of Messrs. Graham, Morton, and Co., visited gas-works at Berlin and Cologne; and the following is their report.

We left England on Thursday, April 15, and on the 16th we went to the head office of the Imperial Continental Gas Association, and after interviewing Herr Hayman, one of the Directors, and Herr Körting, the Chief Engineer, visited the Oberspree Gas-Works belonging to the Company.

Oberspree Gas-Works.

Here we were introduced to Herr Prinz, the Manager, who most courteously took us round and explained everything most carefully, and we gained much information.

There were four settings of verticals, twelve retorts, 16 ft. 5 in. high, in each, with the bottom mouthpieces 8 feet above the floor, worked by one man per shift. His duties were: To charge the retorts and producer; to draw the retorts and clinker the producer; and to attend to the coke-conveyor.

The production of these retorts is about 700,000 cubic feet per day. One other man per shift attends to the coal elevator and conveyor, and general preparation of the coal for the hoppers. This preparation is carried out by means of screens which separate the nuts from the fine coal.

The hoppers are divided into two parts—one for fine coal, the other for nuts. These two kinds fall into the retorts simultaneously in two columns, and the separation reduces the pressure in the retort very much, and greatly facilitates the escape of gas from the coal.

The charging of the retorts with coal from the divided hoppers and the generators with coke is effected from a platform level with the top of the retorts. The coke is discharged from the bottom of the retorts on the ground level; but the workman is not exposed to any great heat, for, as a rule, he stands about 10 feet away from the brickwork.

There was very little smoke either at the top or bottom of the retort when the coke was discharged and the coal run in; but this depends upon the kind of coal. What we saw in use here was 60 per cent. Hebburn Main and 40 per cent. Silesian.

In all cases before the coal is put in, about 35 lbs. of breeze or coke is dropped down to the bottom of the retort, to absorb such tar as does not pass over with the gas, and to reduce the pressure at the bottom of the retorts.

The retorts had been in work 800 days, and were in excellent condition. Scurfing is a short and simple operation, and is done every 35 days. The ascension pipes are seldom, if ever, stopped, and auguring is required only once a week.

The coke-conveyors were of the ordinary type; the quenching was done at the bottom of wooden shoots, which carried off all the steam.

Herr Feld's Process.

The same afternoon we had a long interview with Herr Feld about the new washer that he has invented. He claims that he can remove simultaneously both ammonia and sulphuretted hydrogen in equivalent amounts (without the use of sulphuric acid); part of the sulphur extracted being used in further extraction, and the rest sold.

His washer is extremely simple, requires very little power and attention, and relieves the purifiers of 70 per cent. of the work.

For full application he recommends:

First.—For tar-washer—One chamber, as hot as possible, to cool down to 160° or 120°, according to the nature of the tar, and one Pelouze washer.

Second.—One washer for the extraction of the ammonia and equivalent amount of sulphur.

Third and Fourth.—Two washers for the final extraction of sulphuretted hydrogen.

He was very confident of the efficacy of his process, and asked for a further interview after his return from Königsberg on Sunday. This we gave him, and had a most interesting talk on this and other subjects.

His reports from Königsberg confirm his previous statements. He left them with us, together with drawings of a complete plant for the extraction of sulphur and ammonia, and the necessary description thereof.

Mariendorf Works.

These stand on a site of 350 acres, so are capable of vast extension. No. 1 house contains inclined retorts alone; No. 2 house, vertical—now in use; No. 3 house, verticals in process of erection.

To take the last first—This is designed throughout by Dr. Bueb, of the Stettiner Company, and seems likely to prove most substantial. The ironwork is a variety of combinations of standard sections, and looks very simple and efficient. The brickwork is of fire-bricks made near or at Stettin, and was being laid with the utmost care. We saw the secondary-air flues for the regenerators being laid. The joints were very exact, and the shape of the thin brick of a most useful type. We were told that the whole fire-clay work that had stood so well in the Oberspree works as well as here, was of the same material, and left nothing to be desired; and any builder of similar work would do well to make sure that English fire-clay is as durable as this undoubtedly is.

The house is to contain 28 beds of twelves, and is to produce 140,000 cubic metres or 4,900,000 cubic feet per day, and will be worked by eight men per shift. We noticed that the hydraulic main had condenser sumps attached, cooled by water-tubes, and the liquor goes back to the main.

In No. 2 house there were 168 verticals, fourteen furnaces, twelve retorts to each. Each division of seven furnaces was worked by two men per shift; and we were told that the actual time during which the men worked was 100 minutes per shift. As the time required for complete carbonization is twelve hours, no work is necessary during one of the eight-hour shifts; and the actual work is done in two shifts of eight hours, not in three of eight hours as with us.

The generators are of great depth, and consequently only require to be filled up with coke every twelve hours and to be clinkered every 48 hours.

The make was 330 cubic metres, or about 11,550 cubic feet per ton, before steaming began. Any water gas made then increases the make to about 13,000 cubic feet per ton.

The illuminating power tested by a Carpenter No. 2 "Metropolitan" burner averages 12·13 candles, with a calorific power of 537 B.Th.U.

Below the retorts there was but little steam when being discharged, and no smoke. Above there was a good deal of smoke—said to be due to the class of coal used; but there was more than at Oberspree.

To enable the manager to see how the coal distributed itself in falling into the retort, a wooden model (full size) had just been erected, with inspection doors to show the lie of the coal.

We only made a very cursory examination of the coal-conveying plant. The coal was brought from the wharf in large telpher skeps, holding about one ton each. There was a line direct from the wharf to the retort-house conveyors. On each side of this was a double line of a single rail; and on this pair of rails ran a bridge of wide span also carrying telpher skeps, but at right angles to the main one.

This combination made it possible not only to bring the coal from the wharf to the retort-house, but also to deposit it in the store yard or any given spot, and when required to bring it back to the main line and deliver for use at the retort-house. We thought the arrangement most admirably designed, and understood that the electric plant used to work the whole was only of 40 H.P.

In conjunction with the retorts a blue water-gas plant is used.

The purifier-house is a fine building. The material is used for a long time; one charge having been in use for 527 days.

A new house is being built on the overhead principle with plenty of room below to revivify the oxide.

The tar plant, cyanogen extractor, ammonia extractor, and cooling towers all seemed very up-to-date, and we were told left nothing to be desired in the way of efficiency.

We were told that it is necessary to meet by increased pressure two rushes of demand during the day—first, for cooking from 11.30 a.m. to 2 p.m.; second in the evening, both for lighting and cooking. Of the consumption, 50 per cent. is for cooking.

We took advantage of being in Berlin to see the high-pressure lighting in Belle Alliance Platz, and were much struck by its brilliance. The lamps contained burners in groups of three. They were not too close; they were placed alternately on each side of the roadway, which was about 66 feet wide, and gave a most admirable light all round.

Visit to Cologne.

We drove out to the gas-works at Ehrenfeld, and were courteously received by Herr Hass, the Manager, who took us over the works, which are gradually being equipped with vertical retorts to take the place of oval horizontals.

The vertical installation consists of 240 retorts, which are 13 feet high, instead of 16 ft. 5 in. as at Berlin.

These had worked 705 days continuously; and the condition of those we saw was extremely good. The charges are burnt off in twelve hours, the last two of which are devoted to the making of water gas.

The admission of steam is regulated so that the average gross calorific power of the mixed gas shall not be below 5000 calories per cubic metre (523 B.Th.U. per cubic foot).

The retorts are set ten in a setting, in two rows of five retorts. One producer serves a setting of ten retorts. Each setting has a separate hydraulic main, to which the gas passes by horizontal outlet pipes from the upper mouthpieces of the retorts. On the top of the bench is the charging stage, and at the back are the producer lids. A travelling hopper suspended from an overhead line passes along the lines of retort mouthpieces, and receives from overhead coal and coke storage chambers either small coal or coke. The hopper has a shoot with a spreader which drops into the mouth of the retort. The operations of charging and discharging are very rapidly and easily performed. The coke as it falls out of the

retort is received in a funnel-shaped travelling hopper, the open lower end of which stands over an opening in the conduit in the bottom of which is a conveying trough. One end of the conduit is connected with an upcast shaft, which draws off the steam generated by the quenching of the coke in the conveying trough, and carries it into the outer air. The arrangement works very nicely, and the atmospheric conditions in the retort-house were all that could be desired.

It is claimed that an additional 1·1 per cent. of ammonium sulphate is extracted from the liquor obtained from these retorts, and that as at Oberspree works the tar is purer and thinner.

The make is 90,000 cubic metres = 3,150,000 cubic feet,
to 100,000 cubic metres = 3,500,000 cubic feet per day.

These 240 retorts are charged and drawn by four men per shift per day. To attend to the 24 generators, six men per day are required. Three men per day do the cleaning up.

In addition, the conveyance and separating of coal requires six men per day, and coke handling six men per day—that is, coal handling, carbonizing, and coke handling require 33 men per day for 3½ million cubic feet of gas, but purifiers, &c., in addition to these.

The make of gas per ton, including water gas made by injecting steam into the retorts, is 13,000 cubic feet at least. The make of gas per ton without steam in inclined retorts, 10,600 cubic feet.

The coal store is a magnificent building, capable of holding 40,000 tons of coal—two months' supply, all brought in trucks by locomotive and tipped into the bunkers with taper bottoms to conveyors.

Westphalian coal is their chief material, and costs (say) 13s. 2d. per ton delivered into store. The railway passes close to the works, and carriage is therefore easy, and the great area of the site makes manipulation easy. This coal is highly inflammable, and must be stored with judgment.

The following statement shows the capacity and the results now being obtained at the three works:—

—	Oberspree.	Mariendorf.	Cologne.
	16 ft. 5 in. retorts.	16 ft. 5 in. retorts.	13 ft. retorts.
Number of retorts.	46	168	240
Daily capacity . .	741,300 cu. ft.	2,472,000 cu. ft.	3,350,000 cu. ft.
Gas produced per ton of coal carbonized:			
Without steam	No trials made.	11,336 cu. ft.	11,654 cu. ft.
With steam .	13,094 cu. ft.	13,094 cu. ft.	13,420 cu. ft.
Gas produced per retort per day .	15,538 cu. ft.	15,538 cu. ft.	13,773 cu. ft.
Average heating value of gas (with steam) . . .	523·2 B.Th.U. per cu. ft.	537·7 B.Th.U. per cu. ft.	533·7 B.Th.U. per cu. ft.
Average illuminating power (with steam) . . .	11·5 candles.	12·5 candles.	12 candles.
Coke produced per cent. on coal carbonized . . .	70	70	70
Coke used for fuel per cent. on coal carbonized . .	15 to 16	15 to 16	15 3

The yield of gas, considering the low percentage of nitrogen present, amounting to something less than 2 per cent., is very satisfactory.

With regard to residuals, it is claimed that better results are obtained in every item over those of any system in use. The tar is thinner, containing very little naphthalene, and very little "free" carbon. The ammonia is not decomposed to the same extent, and the quantity is increased 25 to 30 per cent. The coke produced was much larger and harder than that obtained from similar coal in horizontal and inclined retorts, and the percentage of breeze was very small—amounting to only 1½ per cent. on the coal carbonized.

Other advantages of the system are as follows:—

The low labour charges; the cost of carbonizing wages being not more than 6d. per ton.

Increased make of gas per retort per man.

The low cost of repairs due to the increased life of the retorts, and the reduced wear and tear on tools.

Absence of trouble from stopped pipes and pitched-up hydraulics.

The members desire to record their thanks to the following gentlemen for the courteous manner in which they were received, and the valuable information obtained at each of the works visited: Herr Hayman, Director, Imperial Continental Gas Association, Berlin; Herr Körting, Chief Engineer, Imperial Continental Gas Association, Berlin; Herr Prinz, Manager, Oberspree Gas-Works, Berlin; Herr Hass, Manager, Ehrenfeld Gas-Works, Cologne.

Recommendation.

Following up the report of the deputation, the Gas Committee recommend—

That the Council authorize the erection of a suitable number of retorts on the vertical system, to enable the Committee to make a trial of them on a practical scale.

They are of opinion that this can be done efficiently and cheaply in either of the three works, either in a dismantled retort-house as at Meadow Lane, or to replace worn-out beds of horizontal retorts as at New Wortley or York Street.

They are not anxious at present to erect a large installation on any one system, as they are not without hope that one of those that work continuously may attain perfection, in which case they would desire permission of the Council to replace beds of horizontal retorts, as settings wear out, by the latest and simplest of these ingenious systems.

July 1, 1909. C. F. Tetley, Chairman.

Coalite Prospects.

In the "Journal" leader columns last week, some criticisms were offered on the then recently-issued circular to the shareholders of the two Coalite Companies. That some of the views then expressed are held in other quarters was clearly shown by comments in some of the London daily papers. For instance, the "Westminster Gazette" thus wrote: "It is doubtful if the shareholders of the two Coalite Companies, the parent and the subsidiary, will derive a great amount of satisfaction from the interim reports just issued. A certain amount of progress has been made; but the enterprise is still in the experimental stage, and shows no immediate prospect of emerging from that interesting but obviously not very profitable period. Shareholders will be struck with the omissions from the report quite as much as with the information afforded. Up to date [June 25], the Company have produced 14,194 tons of coalite, 383,725 gallons of tar, and 87,264,815 cubic feet of gas; but how the selling value of these products compares with the cost, is left to the imagination. It may, however, be noted that to produce 750 tons of coalite (the quantity which the Company hope to be turning out daily before the end of the year) involves the carbonization of 1250 tons of coal; and we fancy shareholders now learn for the first time that the chief profits are likely to be derived from the distillation of tar rather than from the sale of coalite. Whether the enterprise will eventually prove a commercial success, the future alone can decide; but the patience of the shareholders appears likely to be severely taxed before the dividend-paying stage is reached."

Underground Waters in Slate and Shale.

In the course of an article on this subject in "Engineering Record," Mr. F. G. Clapp says: "Notwithstanding the prevalent belief that slates and shales are not water-bearing, a great many wells have been drilled in them. In the carboniferous formations they are generally drilled to reach more porous beds below. In the Lorraine and other shale formations that contain very little water indeed, wells have been frequently drilled in a forlorn hope that a supply sufficient for domestic uses can be found, and sometimes they are successful. In slates which contain considerable water, however, this source of supply is not always appreciated. To this statement the State of Maine is an exception. In investigations of underground waters made by the writer in 1906 for the United States Geological Survey, the records of all wells in Southern Maine over 50 feet deep were compiled, so far as they could be obtained. In the investigation nearly 600 wells were found in the portion of Maine south of the 45th parallel of latitude. Of these there were 385, regarding which it was impossible to determine with certainty the type of rock. Out of this number, 222 were in slate, and 37 were in schist. As schist is in most cases a metamorphic form of slate, it is here given consideration. Thus in Southern Maine there are 259 wells, or 70 per cent. of those of which the type of rock is known, which are in slate or schist. In North-Eastern Maine, many hundreds of deep-drilled wells have been sunk in slate. . . . To summarize, we can say definitely that plenty of water of excellent quality is found in most types of metamorphic slate. This water may be found almost anywhere within the first 500 feet of the surface, and frequently deeper. The largest supplies are generally found within 200 or 300 feet; but plenty of water for the domestic use of an ordinary-sized family is generally found 50 or 100 feet from the surface. The deeper wells are recommended whenever practicable, as they are safer from chance pollution by surface-drainage. The composition of slate water is variable; but it is nearly always excellent for drinking, and, except in a few regions where there is considerable lime in the rock, it is not too hard for boilers, and causes very little scale."

In the course of an article on "Gas-Engines and Steam-Turbines" in the July number of "Cassier's Magazine," Mr. Percy R. Allen says it is an indisputable fact that from two to three times more power can be obtained by using gas directly in a gas-engine than by burning it under any form of steam-boiler Various authorities have conducted close experiments; and in all cases an economy of more than 2 to 1 has been realized. The writer himself had several years' experience, which enabled him to compare the consumption of gas when burned under boilers and when utilized in gas-engines. It has, he points out, become the fashion to say that capital charges are invariably the controlling factor in the cost of electricity; but where there is a high load-factor—as there must be when the gas derived from coke-ovens or blast-furnaces is utilized—the capital charges on a gas-driven plant compare by no means unfavourably with a steam-turbine plant.

THE PHAROS SYSTEM OF HIGH-PRESSURE GAS AND HIGH-PRESSURE AIR LIGHTING.

An article in the "Technische Beleuchtungs-Korrespondenz" points out that a few years ago there was no competition with the electric arc lamp where sources of light of great intensity were required. Welsbach lamps were at times grouped together several in one lantern, and a large number of various burners were constructed which gave a light of about 300 candles. There was, however, an increasing demand for lights of high power; and to meet this the Pharos light was introduced some years ago. Lighting effects may be obtained with it equal to those of modern electric arc lamps; while also, if desired, lights of lower intensity are just as well obtainable. With the upturned form of burner, the light emitted is projected upwards, and is therefore specially adapted for indirect illumination. A reflector is placed underneath the burner which reflects the light towards the ceiling, whence it is radiated back into the room. This form of lighting is specially applicable to business houses, technical schools, lecture rooms, schools, and draughtsmen's offices, as it has been found that the most delicate work can be carried out by indirect or semi-indirect lighting without the tiring of the eyes which ensues with some other methods of illumiuation.

An Example of Shop and Street Lighting.

Danish Gas Company's Show-Rooms, Copenhagen.

With the Pharos high-pressure gas system gas is supplied to the burners from the gas-mains through special apparatus at a pressure of 51 to 55 inches of water. In passing through the burners, the gas pulls in with itself a large quantity of air, by which a highly-intensified combustion in a small space occurs, and the mantle is raised to intense brilliancy. The high pressure air system, on the other hand, consists in taking air from the open and by means of the Pharos apparatus raising it to a pressure of 51 to 55 inches of water, at which pressure it is introduced through a special service to the burners which are fed with ordinary gas. The gas and air, therefore, mix first within the mixing-tube of each lamp, and there is no mixture of gas and air in the supply pipe. The question whether the high-pressure gas or the high-pressure air system should be adopted, depends solely on local conditions. If there are several consumers in one place requiring the Pharos light, the high-pressure gas system should be adopted. The gas supplied must, of course, be measured to each consumer; and, as it is measured in the compressed state, it is clear that a higher price per unit-volume must be charged for it. The high-pressure air system is, however, more suitable where it is desired to retain existing gas services, burners, cookers, stoves, &c., as then the high-pressure air supply need only be taken to the positions where the high-power lighting is required. Thus ordinary incandescent lighting can be used at the same time as the high-pressure air burners. It would be a work of supererogation to measure the volume of air, as that costs nothing. The cost of compression is also so small as to be practically negligible. The high-pressure gas system is used for street lighting even where the Pharos light is not made available for private consumers. It is also specially applicable to streets and places where there are no existing gas-mains.

According to the article from which we are quoting, the Pharos light shows an economy of 40 to 50 per cent. compared with ordinary incandescent gas lighting; of 40 to 60 per cent. compared with electric arc lighting; from 60 to 70 per cent. compared with electric metallic filament lamps; and from 80 to 90 per cent. compared with carbon filament lamps. The gas consumption per 1000 candle-hours is only 19·6 to 27·4 cubic feet. The lamps are easily attended to; and in the ordinary way they only require cleaning every two to three weeks. The mantles last from 150 to 200 hours. There are no chimneys. The maintenance charges are, therefore, considerably lower than with electric lighting. The light afforded by the Pharos system is said to be agreeable and not fatiguing; and the ultra-violet rays of the electric arc lamp do not preponderate with it.

Pharos Lamps in Centre of Street.

REFLECTIONS ON CARBONIZATION.

By Thomas Settle.

History again repeated itself in the very able papers read by Dr. Lessing and Mr. J. Ferguson Bell, and subsequently discussed, at the recent meeting of the Institution of Gas Engineers. A large amount of time would be needed to find and give the honoured names of men who have on various occasions sounded warning notes such as those heard from Dr. Lessing and Dr. Colman. One might pause to refer to the early days—when, as some remember, there were in use the "Big Ben" and the "Little Ben" ovens, holding charges of 10 cwt. and 5 cwt. of coal respectively, and when, where retorts were used at all they were mostly small in section and of iron—and link them with the present.

In those olden days of low-temperature carbonizing, there was undoubtedly the usual fatal space for gas travel between the coal and the roof of the retort; and, it may be safely assumed that what happened then, in perhaps milder form, is happening now in a more violent form. Hence the greater necessity for a change. In those times there were no alarming records of any great disturbances by decomposition or polymerization of the gases attending carbonization, or any statistics showing the increase of naphthalene troubles, or the reduction of complaints, attended by the wail of what it cost to deal with either. For some years past we have records of papers and discussions condemning the long travel of gas in space and against high-temperature surfaces, with also full admission that such, even in this period, did play havoc with the heating and illuminating properties of the gas manufactured. Without at present dwelling on the special merits of any system of carbonizing, these warnings—then, since, and still—apparently rouse ambitions in inventors to produce something more nearly approaching perfection.

The history of gas manufacture, read and studied, proves still that "it is the longest hill that wears down the slipper most," and that the aim has always been to shorten the journey in the process of carbonizing coal. If any proof of this were necessary, we need only take the inventions of Brunton in 1828, Newton in 1851, Croll in 1857, Evans in 1861, Crampton in 1872, West in 1873, Dempster about 1880, and many others between these years and the present time. All these men were workers towards one end—viz., the continuous carbonization of coal with a view to its yielding the largest possible quantity of gas of the highest illuminating power. For the purpose of comparing theories with actual work, and tracing progress from more recent times to the present, it may be worth while to revive a few "old sayings," and put them with a few "new sayings," and from the progress in work covering a similar period we shall be able to see how much has been done, how much left undone, and how much has remained as it was in the beginning.

Mr. Norton H. Humphrys, in his book on "The Chemistry of Illuminating Gas," published in 1891, states (p. 212):

> It will be convenient to divide the effect of the heat as regards the production of gas into (1) the primary, as causing the evolution of volatile matter, and (2) the secondary, as relating to the effect exercised by the heat on the volatile matter after it is formed.

And later Mr. Humphrys says (p. 219):

> If we carbonize coal in thin layers, say one to two inches thick, at good heats, the yield of tar is practically *nil*.

Professor Vivian B. Lewes, in his lecture to the Irish Association of Gas Managers, in 1904, on "The Carbonization of Coal for the Production of Illuminating Gas," said:

> The ideal carbonization of coal would consist in subjecting every particle to a perfectly uniform temperature, so regulated that the decomposition of the hydrocarbons in the coal would yield hydrocarbon gases of the highest possible illuminating value. . . . Having gasified the hydrocarbons, the next essential is to remove them as rapidly as possible from the zone of heat, in order to prevent any secondary actions, which by decomposition or polymerization would break them up into less valuable heating or lighting gases. . . . It is at once evident that uniformity of action is really the keynote of success in any process of carbonization.

Professor Lewes, speaking of the Settle-Padfield process, also stated that the larger yield of gas and the higher sperm value were obtained at the expense of the tar, which in the process was "returned to the retort and again carbonized."

In the third volume of Groves and Thorp's Chemical Technology, Mr. Charles Hunt says (on p. 19):

> The different products obtained at higher temperatures are the result of the further decomposition of the primary products of the carbonization. As these gases pass through the surrounding mass of incandescent coke and along the heated upper portion of the retort, they decompose in various ways, producing other hydrocarbons and free hydrogen, and depositing carbon on the walls of the retort and in the pores of the coke.

And on p. 20:

> At the commencement of the carbonization of a charge of coal, when the exterior portion of the mass is undergoing decomposition, the hydrocarbons produced, not having to pass through or over incandescent coke, escape from the retort with comparatively little change. The illuminating power of the gas is high; and it contains but little of the more highly condensed hydrocarbons. As the carbonization progresses, however, the exterior portion of the mass becomes converted into coke, and its temperature rises and approximates to that of the retort itself; so that the gases produced in the interior of the mass have to pass through a gradually increasing thickness of incandescent coke. Consequently, the decomposition of the hydrocarbons becomes more and more complete, until finally little but hydrogen, with some methane, is produced. After the bulk of the gas has been driven off from the coal, it still continues to give off hydrogen for some time—adding to the volume of the gas produced, but lowering its illuminating power. Moreover, as the heat penetrates further and further towards the centre of the mass of coal, the amount undergoing decomposition at any one time continually decreases, so that the volume of gas given off gradually becomes less. This effect is increased by the low conducting power for heat of the surrounding coke.

Dr. Lessing states (see "Journal" for June 22, p. 841):

> By contact with the hot-coke, and by the surface and the radiant heat of the walls, it would suffer a degradation, with incidental deposition of carbon.

Dr. Colman, on p. 859 of the same issue, states:

> In carbonization, they had to consider two main points. In the first place, they had, in order to drive out from the coal the maximum quantity of the volatile matter, to heat the coal finally to the highest temperature they could obtain. On the other hand, the volatile products, which were first formed by the distillation of coal, themselves, under the further action of heat, underwent decomposition, which, up to a certain point, was favourable to the gas maker, but after that became disadvantageous. They wanted to hit the happy mean, whereby in carbonizing they could obtain the first of these desired ends—the raising of the coke finally to a very high temperature—without at the same time subjecting the volatile products to over-cracking or to too great an extent of decomposition.

Further on, towards the close of his remarks, Dr. Colman said:

> So it seemed to him they must aim at the cracking-up of the tars which were produced in the vertical retorts and the coke-ovens, just to the extent—they had to find out what it was—where the tar gave up its maximum quantity of carbon to the gas, without at the same time increasing the amount of free carbon and of naphthalene to an abnormal extent. This was the problem; and it would require a great deal of work before they could successfully solve it. But if they bore this in mind, and worked at it, no doubt eventually they would obtain the full benefit of the gas manufactured from the tar.

Mr. R. Forbes Carpenter, the Chief Inspector under the Alkali Act, in his last report, noticed in the "Journal" for the 15th ult., said (p. 708, col. 1):

> In the continuous vertical retort a zone of maximum and continuous heat exists perhaps at about three-fifths of the depth of the retort, measuring from the top.

The theories put forward as to what takes place inside a retort during the distillation of coal have long since been confirmed; and they are still with us in every-day work and practice. Whether these have moved forward, stood still, or gone backward, can well be gleaned from the tone of the papers and discussions so recently published.

The statement that was made eighteen years ago by Mr. N. H. Humphrys, he confirmed when he tested and reported upon the Settle-Padfield process at Exeter, where in some tests he obtained only 4½ gallons of tar per ton of coal carbonized, in others had no tar at all to reckon with, as the figures of his tests show. The figures will be found in the "Journal," July 28, 1903, p. 235.

What Professor Lewes in 1904 told the Irish Association we are constantly repeating; and we have not altogether failed in approaching "uniformity of action," which he so aptly described as being really the "keynote of success in any process of carbonization." The earnest invitations by Dr. Colman to "hit the happy mean," and to "aim at the cracking-up of the tars," are surely partly answered in the results obtained by Professor Lewes, Mr. Humphrys, Mr. R. G. Shadbolt, and other experts, who tested for themselves the Settle-Padfield process at Exeter. These results have been published from time to time.

It may not be out of place here to draw attention again to the portion of Mr. Forbes Carpenter's report dealing with the "zone of maximum and continuous heat" at "about three-fifths of the depth of the retort," and what was later on stated in the letter which appeared under the heading of "Vertical Retorts" in the "Journal" for the 22nd ult.: "Ideal carbonization appears to remain in the zone-length of a retort fed from 2 to 3 feet from the bottom—occupied by hot coke—and on to a height of not more than 8 feet in all, giving also out of this a clearance of at least 1 foot above the charge at the top of the retort."

By a perusal of Professor Bunte's diagram, it is plain that there has been no approach to uniformity of production, either in the volume of gas obtained or in the illuminating power; proving the truth of Mr. Irving's remarks in the recent discussion that "it could never be a correct system of working to pass into a chamber 5 or 6 tons of coal, and there let it distil for 24 hours," and that "they must look to the continuous process as being most likely to produce the best and the most scientific results." Taking

the highest production of gas and illuminating power in Professor Bunte's diagram as being 100 per cent. in each case, we get—

	Make.		Candle Power.
1st hour	100 p. ct.	..	100·0 p. ct.
3rd ,, drops . . .	30 ,,	drops	51·5 ,,
6th ,, ,, . . .	37 ,,	,,	61·0 ,,
9th ,, } . . .	}		58·4 ,,
12th ,, } ,, . . .	} 40 ,,	,,	58·4 ,,
15th ,, } . . .	}		67·5 ,,
18th ,, ,, . . .	52 ,,	,,	85·0 ,,
21st ,, ,, . . .	67 ,,	,,	94·0 ,,
24th ,, ,, . . .	92 ,,	,,	100·0 ,,

Taking Mr. Bell's figures of candle power as 19·9 the first hour, we get—

	Candle Power.
1st hour	100·0 p. ct.
4th ,, drops	26·0 ,,
8th ,, ,, ...	71·5 ,,

Taking the average production of gas as obtained hourly at four different works with horizontal retorts—

	Make.
1st hour	100·0 p. ct.
2nd ,, dropped	32·4 ,,
3rd ,, ,, ...	64·2 ,,
4th ,, ,, ...	86·8 ,,
5th ,, ,, ...	93·8 ,,
6th ,, ,, ...	96·3 ,,

Taking a single case where good large coal was used in horizontal retorts, we get—

	Make.		Candle Power.
1st hour	100·0 p. ct.	..	100·0 p. ct.
2nd ,, dropped . .	21·9 ,,	dropped	11·2 ,,
3rd ,, ,, . .	53·2 ,,	,,	22·3 ,,
4th ,, ,, . .	90·7 ,,	,,	33·4 ,,
5th ,, ,, . .	93·7 ,,	,,	62·0 ,,
6th ,, ,, . .	96·9 ,,	,	77 8 ,,

Taking the averages of the tests already given, extending over three months, using slack coals with short-length carbonization and contact, in a vertical retort at Exeter, the results were as follows:—

	Make.		Candle Power.
1st hour	100·0 p. ct.	..	100 p. ct.
2nd ,, dropped . .	12·3 ,,	..	nil.
3rd ,, ,, . .	15·9 ,,	..	0·7 ,,
4th ,, ,, . .	18·6 ,,	..	0·7 ,,
5th ,, ,, . .	18·6 ,,	..	0·7 ,,
6th ,, ,, . .	28·0 ,,	..	13·9 ,,

At the sixth hour the feeding was stopped and the charges were burnt off for the purpose of weighing the coke and measuring the tar (if any) and liquor to record the tests.

With Dr. Colman's earnest words of encouragement, and with the results shown above, there is surely something stimulating to further efforts in a direction that will realize the desire of Professor Lewes for uniformity of action in carbonizing processes.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to Beckton.

What was in every respect a perfectly successful day was spent last Saturday by the large contingent of members of the Midland Junior Gas Engineering Association—they must have numbered close upon fifty—who paid a visit to London. The railway arrangements allowed of over twelve hours between the arrival at Paddington and the departure therefrom on the return home; but this proved none too long a time for those who desired to take part in all that had been arranged for them. The programme was such an attractive one that under any circumstances the visit could not have failed to be both a pleasant and instructive one; but the ideal weather conditions certainly added much to its enjoyment. As already explained, the visit originated in the fact that, when the Junior Associations met together at the Franco-British Exhibition last year, the Midland members could not arrive until late in the afternoon, when the gathering in the Congress Hall had been concluded; and Mr. W. J. Liberty, the President of the London and Southern District Junior Association promised that he would endeavour to arrange a day for them in London this year. The proposal was accepted, with Beckton as the objective; and Saturday's proceedings were the result.

When the visitors arrived at Paddington, they found awaiting them Mr. Liberty and Mr. H. Rothwell, a member of the London Junior Association Council; and without a moment's delay, two motor omnibuses, which had been chartered for the occasion, were boarded, and a start was made for the Beckton works of the Gaslight and Coke Company, permission to inspect which had been granted by Mr. D. Milne Watson, the General Manager. The run through the City enabled many of London's sights to be briefly but effectively noted; and after the somewhat lengthy railway journey, the drive in the open air proved doubly welcome. When, shortly before one o'clock, Beckton was reached, the travellers received a hearty welcome from the officials of the Company's staff who (by direction of the Chief Engineer, Mr. Thomas Goulden) were awaiting them; and they were also greeted by other members of the London Junior Association Council who had arranged to meet the party there.

The visitors were shortly afterwards made acquainted with the fact that the most hospitable preparations had been made for their reception; for they were invited into the offices, where they sat down to an excellent luncheon, to which ample justice was done. The chair was occupied by Mr. J. N. Reeson, the Resident Engineer; and it was noticed that in front of him were ranged several handsome silver cups, which had been won by the Company's Rifle Club at Beckton—an institution in which a great deal of interest is taken, and among whose members are to be found many excellent shots. After lunch, Mr. James Hewett, the President of the Midland Junior Association, proposed a hearty vote of thanks to Mr. Milne Watson, Mr. Goulden, and Mr. Reeson and his staff, for what they had done to make the visit to Beckton so successful, and also for the generous hospitality which had been extended to the party. The proposal was seconded by Mr. Harold E. Temple (the Hon. Secretary and Treasurer of the Midland Junior Association), supported by Mr. Liberty, representing the London contingent, and carried by acclamation. In reply, Mr. Reeson said that it was very kind of them to accord such a hearty vote of thanks, not only to the General Manager and the Chief Engineer, but also to himself and his staff, who would share his pleasure in showing the visitors the wonders of Beckton. It was a matter of great regret that the party had not been able to arrive earlier, because they had missed seeing in operation a part of the works on which the Company prided themselves very much indeed, He referred to the repair shops, which were on an extensive scale. Work in these, as it was Saturday, would have ceased when they reached them; and so they would have to be content with seeing what the shops were capable of doing. They were delighted at Beckton when any of their brethren in the profession favoured them with a visit; and they would endeavour in the future, as they had done in the past, to extend such hospitality as would make those who came feel that it would at any rate not be an unpleasant duty to have to come there again.

In the inspection of the works which took place both before and after lunch, the party were under the guidance of Messrs. J. L. Anderson, J. C. Johnson, A. H. Solomon, R. W. Hunter, and S. H. Wood. They did not, of course, go over the whole of the 263 acres which the works occupy, nor did they enter all fourteen retort-houses; but an itinerary had been sketched out which enabled an excellent idea to be gathered of the style of the plant and the nature of the operations that are carried out. The number of 10-feet retorts at Beckton is 8768, of which 1620 are hand-worked, and 7148 machine-worked. With the exception of two houses (where Arrol-Foulis chargers and the Hunter-Barnett pusher are employed) the machinery used is of the West type. At the present moment (which is, of course, the time of lightest consumption) there are five houses working – four with the West machines and one with the Arrol-Foulis. The productive power of the works is about 75 million cubic feet (13 million feet of carburetted water gas) per day; and the highest make in 1908 was 62 million cubic feet per day. The number of workmen employed in winter is upwards of 4000. Though, as stated, the area of the works themselves is 263 acres, the Company own about 1000 acres of land altogether at Beckton. The total holder capacity at these works is 19 million cubic feet. The gas is pumped from Beckton to London for storage and distribution through 48-inch high-pressure mains.

After inspecting one of the exhauster-houses, the party entered cars, and were drawn by locomotives up an incline and along a viaduct to No. 2 pier. Coal is stored under this viaduct; being conveyed from the piers in waggons fitted with bottom discharge doors, and deposited where required. It is then picked up again into trucks on the viaduct or the ground-level by steam-cranes with Hone's grabs. The storage capacity here is about 230,000 tons. On No. 2 pier there are twelve hydraulic cranes, worked at 750 lbs. pressure. Each crane carries a one-ton Hone grab, and is capable of slewing round to deposit coal into trucks. There is also fitted a luffing jib, by means of which the grab can be adjusted to any position in the ship's hold. About a minute is taken to complete the cycle of movement—lowering, raising, and depositing into truck. The average capacity is 50 tons per crane hourly; and the total capacity of the pier is about 12,000 tons per day. When filled, the trucks are passed over a weighbridge, of which there is one for each berth; the accuracy of these machines being checked weekly.

Re-entering the cars, the visitors proceeded along the viaduct leading to No. 1 pier. On the way was passed the hydraulic pumping-house supplying power for the two piers. This contains the following compound hydraulic pumping-engines: Two of 125 H.P., having 14-inch high-pressure and 24-inch low-pressure cylinders, 21 inches stroke, pumping 200 gallons per minute each. Three of 200 H.P., having 14-inch high-pressure and 14-inch and 24-inch low-pressure cylinders, pumping 320 gallons per minute each. The steam pressure in each case is 130 lbs., and the water pressure 750 lbs.

There were also passed retort-houses Nos. 13 and 14, which have a capacity of 7,500,000 cubic feet per day; and note was made of the system of viaducts connecting the piers with high-level railroads into the coal-stores of the retort-houses. Each retort-house has two low-level railroads for the removal of coke (one on either side of the retort-bench), and also two high-level roads over the coal-stores connected with the viaduct. Along these coal-waggons are run, each containing about 5 tons, and fitted with bottom discharge doors. In addition to the retort-house railroads, there is a viaduct running between the two main rows of houses, and another which joins this with No. 2 pier, running round the outer edge of the works. These are mainly used for coal storage. As a matter of fact, there are over 40 miles

of railway altogether on the works. All the main roads to the chemical works, the Great Eastern sidings, the viaducts, and the inclines are under control from signal-boxes—being worked on the block system. An instrument indicates the presence of a train on a section; and no other train is allowed on the section without warning by the signalman. The coke roads into the retort-houses are worked by hand signalling.

No. 1 pier is old, and is now seldom used for unloading coal, but largely for other materials, and for loading coke and chemical bye-products. It is double decked, with hydraulic rams and steam winches on the lower deck, and cranes and capstans on the upper one. The cranes carry skips holding about 12 cwt., which are filled by hand; and consequently the working is more expensive than at No. 2 pier.

Coming down the incline, the members saw the compressors which supply power for six retort-houses fitted with West's compressed air stoking machines. The large compressors have 15-inch steam cylinders and $9\frac{3}{4}$-inch and $14\frac{1}{4}$-inch air cylinders in tandem; the air being compressed in two stages. Two of these machines deliver 29,200 cubic feet per hour; a single West compressor, 16,000 feet per hour; and an Ingersoll compressor, 20,000 feet per hour. The total capacity of the retort-houses supplied by these compressors is about $25\frac{1}{2}$ million cubic feet per day. Some time was spent walking through the large repairing shops, though everything there was at rest. An idea of the character of the work carried on may be gathered from the fact that there are 31 locomotives, two of which were built at Beckton. All repairs and renewals are undertaken in the shops; and rolling stock is built and repaired.

The retort-houses which had been set down for visiting were Nos. 8 and 13. The capacity of No. 8 is about 420 tons of coal a day, or $4\frac{1}{2}$ million cubic feet of gas. There are thirty settings of ten retorts—600 mouthpieces, or 300 20-feet retorts. The retorts are 22 in. by 16 in., set in five tiers, and heated by regenerator furnaces. Six-hour charges are worked; and the make is 7500 cubic feet per mouthpiece per day. There are West compressed air machines; and the scoop enters the retort twice to deposit a charge of nearly 4 cwt. With these machines, retorts are drawn and charged at an average rate of about one per minute. There are four coal-breakers with elevators to hoppers, each driven by a 27 I.H.P. "National" gas-engine. The hoppers hold about 400 tons. There are towers for the automatic removal of tar from the hydraulic main. In connection with No. 13 house, there is storage for upwards of 6000 tons of coal; and here there are the Arrol-Foulis machines, and hydraulic pushers.

The visitors also inspected the twelve sets of Humphreys and Glasgow carburetted water-gas plant, which have a capacity of about 13 million cubic feet per day; and they saw a quantity of other plant—including purifiers the lids of which are lifted by means of hydraulic rams rising in the centre of the boxes.

When at last the exigencies of time compelled the party to make their way again to the works entrance, they remounted the motor omnibuses, and were conveyed back to Holborn Viaduct, where, under Mr. Liberty's guidance, they entered the City subways, some particulars of which were given in the "Journal" for March 9 (p. 729). These subways are 11 ft. 6 in. high and 7 feet wide where they are under the footpath; while under the centre of the roadways they are 12 feet wide and 7 ft. 6 in. high, and semi-circular in shape. Their construction (to avoid opening up busy thoroughfares) was commenced in 1866; and they contain high and low pressure gas-mains, water and hydraulic supply mains, telegraph and telephone wires and cables, electric light cables, and pneumatic tubes. Mr. Liberty, in the course of the walk, clearly pointed out the simplicity of mainlaying by this method, and the ease with which connections can be taken to any house along the line of route.

The party came to the surface again just at the point where Fleet Street joins Ludgate Circus, and then stepped into Yexley's Restaurant, where they had tea together—being joined by some more friends, including Mrs. Liberty and other ladies. At the conclusion of this function, Mr. Hewett proposed a hearty vote of thanks to Mr. Liberty, and remarked that the London and Southern Junior Association were to be congratulated upon having such a President. He deserved the gratitude of the Midland Junior Association for the way in which he had carried out the arrangements for the visit; and, in addition to this, for having given them an interesting and instructive walk through the subways, which was doubtless a unique experience to most of them. Mr. Temple, in seconding, said that they had all of them much enjoyed the visit to Beckton; but perhaps they did not all recognize that it was through Mr. Liberty that they had been able to go there at all. He it was who obtained in the first place permission from Mr. Milne Watson to go to Beckton, and who made all arrangements. In addition to this, he had afforded them the great advantage of viewing distribution methods in the subways of the City, and had lucidly explained to them everything in connection therewith. The vote having been carried with acclamation, Mr. Liberty, in acknowledgment, said it was a source of great gratification to him to find himself in the position he did that day; and the little share he had taken in the day's arrangements had given him great pleasure—as it always did to do anything that brought him into touch with his *confrères* of the other Associations. He would willingly do for any of the other Associations what he had done that day. He thought it was Mr. Corbet Woodall who had said, "If you want to see Beckton properly, you will stay there three weeks;" and when they considered that they had only spent three hours there, they would agree that they had made the most of their time. Under the new scheme, no less than 11,000 men were now co-partners in the great undertaking of the Gaslight and Coke Company. He hoped this would not be the last time that the Midland and London Juniors would meet, and that those who had come up to town that day would take back the very hearty greetings of the London members to those who had been unfortunately prevented from joining the party. He trusted it would not be very long before the London Association paid a visit to Birmingham.

Before the party separated, Mr. J. Hinch, the Gaslight and Coke Company's Lighting Inspector of the City, said that it would give him great pleasure to show round during the evening any of the visitors who might desire to see the latest methods of gas lighting in London. A small band of enthusiasts availed themselves of this invitation; and they had no reason to regret their choice. After traversing the West End (by way of the Gaslight and Coke Company's Kensington show-rooms), a return was made to Kingsway and Fleet Street, where the high-pressure gas lighting was inspected; and then a visit was paid to the compressing station, and to the Temple for the purpose of examining the stair lighting carried out by the Gaslight and Coke Company, which drew forth many complimentary remarks.

ON VIEW IN THE DAVIS GAS-STOVE COMPANY'S SHOW-ROOMS.

Some weeks ago, reference was made in the "Journal" to an interesting object which had been seen in the Queen Victoria Street Show-Rooms of the Davis Gas-Stove Company, Limited. This was a cooker which was supplied by the firm to one of the London Gas Companies as long ago as 1878, and which had been returned to its makers after a life of utility extending over about thirty years. At the time it was not possible to give an illustration of this old cooker; but we are able to do so now, and would remark that comparison of it with the Company's latest pattern —the Davis 1909 screwless cooker—furnishes striking proof of the enormous advances that have been made during the past quarter-of-a-century in the matter of detail. The comparatively early position occupied by this cooker in the history of hiring-out of gas-stoves in London will be gathered from the fact that it

A Davis Gas-Cooker of the Seventies.

bears the South Metropolitan Company's label, and their number 1035; and yet, after all its years of active service, it is still in very good condition. Among the points that most attract attention in it are the wrought-iron ring burners under the hot-plate; and these three burners, it must be confessed, do show the signs of wear that would naturally be expected. The outer and inner casings of the stove are of plain sheet-iron, without packing; and the gas supply enters at the back of the oven. The runners on which the inside shelves rest are screwed on to the body of the stove; but the sides of the oven have no screws—being held together by corner plates. In fact, as was remarked when previously referring to the stove, a comparison of the old type with the latest "screwless" model turned out by the firm lends support to the contention that the manufacturers of the Davis gas-

stoves have—in the elimination of unnecessary screws—kept in view, right from the beginning, the question of maintenance.

The object of the present article is, however, not so much to refer to the past as to draw attention to what is being done now in the way of designing appliances for the utilization of gas. In spite of the presence there of the afore-mentioned old cooker, it must not for a moment be imagined that the Davis Company's show-rooms are a museum. Nothing could be farther than this from their true designation; for they contain a varied assortment of the latest forms of apparatus for use in gas heating and cooking. Leaving out of question on this occasion the screwless cooker, which is already well known to gas engineers throughout the country, and the steamless radiator, which was brought so much to the front by the firm last season, there are many other things to be seen there which are deserving of some notice.

To turn at once from the oldest to the newest, the Company have of late been giving their attention to the perfecting of a fresh type of water-heater, which has been named the "New Davis" gas-heated circulator. This is being made in two sizes; and it has been designed with the object of obtaining the greatest amount of heating surface in the smallest possible cubical space. A size calculated to give an equivalent of two hot baths per hour, and suitable for connecting to a 20 or 30 gallon circulating tank, is only 15 inches high over all, $12\frac{1}{2}$ inches wide, and 9 inches deep, with 1 inch flow and return pipes; and it contains 6 square feet of heating surface. The circulator is heated by a powerful triple cast-iron burner, which can be easily removed for cleaning purposes without in any way disturbing the gas connection. Over this burner is the patent heating chamber through which the water passes. This chamber is practically a tube made up of fins and rings alternately. The fins, or plates, are of mild steel, electrically welded; and they extend both inside and outside the tube. The great area of the outside portion—the plates are close together—is thus used for taking up heat, practically the whole of which is immediately conveyed to the water by means of the part of the plates which projects inside the tube. Outside the tube is a copper jacket, bolted on to a base plate; and the whole is then fitted into the outer case, which is of stout cast iron, of the highest quality used for hydraulic purposes. Between the copper and cast-iron casings is arranged a water-jacket, to prevent waste of heat by radiation. The cold water flows in at the top of one side, and fills the whole of the space between the two casings. Then it flows through an opening direct into the heating chamber; and as it passes through there, it is rapidly heated. The continuous circulation of the hot water, together with the rotary action set up by the formation of the tube, prevents furring-up. Any scale or deposit that may collect in the circulator can be easily removed; as in designing it particular attention has been paid to the point of accessibility for cleaning purposes, in order that the full efficiency may be maintained. The passages through which the flue gases pass can also be effectively cleaned; while great durability is claimed as a further feature in favour of the appliance, which can be had either with or without a thermostatic valve, for the purpose of automatically cutting down the gas consumption when the water reaches the desired temperature.

The "New Davis" Gas Heated Circulator.

Another novelty which the Company are manufacturing is Serne's patent hot-closet, which can be fitted to the top of any cooker, and has been designed with the intention of keeping warm plates, dishes, puddings, &c., by utilizing the waste heat from the oven and hot-plate burners, thereby effecting a great saving in gas as well as floor-space. The waste heat from the oven is conveyed to the hot-closet by means of a special pipe fixed at the back of the cooker, and is passed off through an outlet on the top of the hot-closet. When neither the hot-plate nor the oven is in use, and the hot-closet is required for warming purposes, it can be heated by a small atmospheric swing-burner fixed immediately under the bottom of the hot-closet. This burner can be thrown back when not in use. The door is swung at the top, and has a quadrant fitted at the side for support when open. This hot-closet is made in two stock sizes—24 inches and 30 inches wide—and five different varieties. The space between the bottom of the hot-closet and the hot-plate is 18 inches, which gives ample room for large utensils.

The Davis Gas-Stove Company have, of course, a very wide reputation for gas cooking appliances on the large scale, suitable for hotels, restaurants, business establishments, and public institutions; and there is a very large selection of these goods on view in their show-rooms. There are huge roasters, with the fronts, doors, base, and top frames of cast iron, and the outer casing

Large Roaster for Hotels, &c.

of extra-stout steel plates, with angle iron supports at the corners. The inner casings are enamelled steel plates; and there is a packing of patent non-conducting material. Inside are wrought-iron hanging runners for supporting the shelves, which may be easily detached for cleaning purposes; and these runners are arranged so that the shelves may be placed at any height, and withdrawn nearly their entire length without overbalancing. The burners are regulated to burn at low pressure without firing-back, and are protected by splash plates from falling fat; while each burner is under control of a separate tap. The doors and sides of the ovens are encased with polished oak or mahogany, iron tongued, and bound with polished brass bands; while pyrometers are fitted to indicate correctly the cooking heat.

Another appliance, which is found extremely useful in large establishments, is the firm's new and improved gas hot-closet. This has a body of extra strong cast iron, with wrought-iron sliding doors mounted on rollers. Inside there are three perforated shelves, and an atmospheric burner so arranged that it may be easily cleaned. The closets can be fitted with tiles or polished wood panels; and the carving table top can be arranged with either hinged or balanced covers.

Gas Hot-Closet.

There was also noticed, when passing through the show-room, an automatic hot-plate, fitted with a pilot-light. On placing a vessel over the burner, a knob is depressed; and this turns on the gas, which is lighted by the pilot jet. Inquiry elicited the fact that a good measure of popularity has been secured by this arrangement. Then there is the "Gascol" patent convertible gas and coal range, the oven of which can, when desired, be heated with gas and coal conjointly.

In bringing this notice to a close, perhaps, as indicating the tendency of the times, one other matter may be referred to, which was mentioned by Mr. Cyril G. Davis, the Managing-Director, and that is that the existing laboratory at Luton is making way for an altogether bigger place, which will be fitted with the latest scientific apparatus, so as to permit the Company to carry out exhaustive experiments both with high and low pressure gas apparatus.

GERMAN ASSOCIATION—ANNUAL MEETING.

Inaugural Address of Mr. E. Körting, the President.

(*Concluded from p. 972.*)

In his inaugural address (the first portion of which appeared in last week's "Journal") Mr. Körting gave a history of the gas industry during the last fifty years—impressions and views of a technical man who was born and brought up on a gas-works, and has been active in the gas industry for twenty-eight years. After recording some of his earlier experiences, and referring to the work of his predecessors in connection with the gas supply of Berlin, he pointed out that the fundamental principle of their work was "far-reaching economy"—that an old installation was never replaced by a new one on the gas-works, but additions were always made wherever there was room for them. He then proceeded as follows.

It was the same with the distributing system in the town. Gas at that time was an illuminant *de luxe* in the fullest sense. The consumption per head of the population was very small, and the pipes only needed to have a very small diameter. Drory aimed with the greatest strictness at having no new main laid before it was absolutely necessary, and at carrying out no fresh connection without absolute certainty of its earning power. The net result was an extremely low installation capital and a very high net profit. Naturally, it must not be forgotten that coal and wages were very low at that time, and that coke, owing to the small extent of gas manufacture, was saleable at high prices. Thus things went on well for a good many decades. Then came the competition of petroleum on the one hand and of electric light on the other, and the great rise in wages; and the old profitable state of things came to an end.

A new era, with fresh views and methods of working, dawned; and who was it who stood on the threshold of this new period and served as our guide to the fresh goal? No other than the distinguished man and *savant* who, as our General Secretary, remains to-day at the head of our Association—viz., Geheimrat Dr. Hans Bunte. The first great work which he carried out, in conjunction with Dr. Schilling, was the scientific investigation of producer-gas firing. This marked the delivery from the earlier period. I can well remember the zeal with which the more advanced gas engineers flung themselves in this new direction. With what difficulties, however, they had to grapple before theory and practice were brought into unison! But a start had been made. Science had been placed at the head of German industry. What does this mean? We understand by Science, the systematic arrangement and co-ordination of that instinct of investigation and discovery which is the primæval dowry and the glory of the Aryan race. To be scientifically trained means not only to know the results of earlier inventions, but also the ways by which they have been achieved. To work scientifically means, on the basis of exhaustive study, to address methodical questions to Nature, and to understand the answers of Nature with open impartial senses, and to learn to act upon them with entire faith. To seek the truth and to give honour to the truth is the aim of Science. Our Association has adopted this aim in deciding, at the instance of Bunte, to found its Instructional and Experimental Gas-Works. I do not judge the value of this Institute of ours by the results which it achieves at the moment. These depend more or less on chance, or on the endowment of men directly interested in it. Rather do I value it for the spirit in which it was brought into being. The Experimental Gas-Works will seek the way to the truth, and must, like an impartial, incorruptible Court, be an umpire in the service of Truth. Truly, we ought to be proud that in our Association there was a majority for such a high ambition, and that the German gas-works, by rich material contributions, have shown their full agreement therewith.

Gentlemen, I cannot, unfortunately, fully portray to you the great advances for which our industry has to thank Science. It must suffice to quote a few great names. Without Auer von Welsbach gas would to-day have completely vanished as a means of lighting. The struggle with our old enemy naphthalene also distinguishes characteristically the rule-of-thumb and the scientific ways of working. For years and years the means of avoiding naphthalene stoppages was a standing heading in the technical literature and a constantly recurring theme for papers at meetings. What endless time and trouble have the so-called practical men spent on the naphthalene question, but in vain! They did not understand how to draw correct conclusions from properly arranged investigations. Then came Dr. Bueb (a pupil of Bunte) who used the oil in which naphthalene best dissolves in a special standard washer. Thus the naphthalene question was solved; and, still more, Bueb taught us, by most meritorious researches with vertical retorts, how, even in carbonization, the formation of naphthalene can be avoided. Not only this, but his scientific review of the results of carbonization in vertical retorts has overthrown the views of several generations of gas men, and at one stroke has established as chemically and economically correct carbonization in completely filled retorts. Further proofs of the stimulating influence of Science on our industry are not needed. We may hope that these influences will continue to gain in strength, as the number of our technical men having a complete college training is constantly increasing; and—*noblesse oblige*—I expect our young men to put us (their predecessors) to shame by the capableness of their performances.

But Science does not do everything. There are many other important factors co-operating in the transformation of conditions, and, in particular, competition. The gas industry, which had for so many years all the advantages and disadvantages of a monopoly, found itself suddenly exposed on two sides to a heavy attack. Electricity pressed it on the one hand, and extremely cheap mineral oil on the other. For a time it appeared as though the *rôle* of gas as a means of lighting was played out. Then came active men who set themselves to conquer a new field of activity for gas as a valuable heating agent. The Dessau central workshop was started; and in Hanover my Company allowed Richard Goehde to sound his battle-cry "Cook with Gas," which later went from Berlin into all Germany. The ice was thereby broken. The superior gas manager of the good old time remained quietly at home and let the public ask him for a gas supply; whereas the gas manager of to-day must use all the methods of the modern business man in order to allure customers. Among these methods may be mentioned shop exhibits, advertisement by word and pen, letting apparatus on hire, and payment by instalments. Hand in hand with this revolution, there has been a complete change in the customers. The none too numerous large and rich consumers went over to electric lighting. Gas, however, by way of the kitchen, secured the whole middle position, and so entered again by the back door into the sphere of opulence. And not content with the middle position, we are now busy, with the help of automatic meters which had first been used in England, in gaining the lower strata of the population as gas consumers. In other words, gas-works now year by year expend very great sums on connecting to the distributing system, without charge, all houses in which there is no gas; and shortly this object will be completely attained. Truly that is a revolution in one or two decades such as would have scarcely seemed possible. This powerful movement in favour of new gas connections was supported by the striking development of commerce and industry. It was not only that there was more money constantly available and more people continually coming into a position where they could frequently spend a copper on gas. No, there were also great forces acting for the improvement of lamps and heating apparatus, and for the introduction of new types in the market. Thanks to the striking elaboration and introduction of the inverted incandescent light and of high-pressure gas lighting, it was possible for gas lighting to attain complete economical superiority in the contest with electricity. Then industrial works came more and more into the foreground as large consumers. To-day there are works which consume 35 to 70 million cubic feet of gas per annum for heating.

While the rise and improvement of industry in Germany have thus proved powerful incentives to gas consumption, they have at the same time exerted no less influence on the modification of our methods of gas manufacture. The profitableness and the security of gas supply were threatened by the rise of wages and the unreasonableness of the workmen. Then great engineering and fire-brick works, with the help of gas engineers, produced that large number of mechanical appliances which render us completely independent of our workmen. Coal is unloaded, stored, and taken from the store mechanically. In the retort-house drawing and charging machines, inclined retorts, carbonizing chambers, and vertical retorts have shown most successful development. For coke, conveying chains and reservoirs for the night production have reduced hand labour to a minimum. By dividing the stream of gas and by adding air, labour in the purifying house has become almost unnecessary. Following the example of England, where years ago Mr. Corbet Woodall constructed the first gigantic gasholder, German gasholder construction has attempted the greatest of tasks with success. For the distribution of gas, fans, high-pressure mains, and governor stations at suitable points of the distributing system, have been adopted. In other words, our gas-works have made full use of the resources of the constructing and civil engineer, and have grown according to the need for gas manufacture and the handling of materials on a large scale into superior and well-arranged workshops. The advance which has to be chronicled in regard to the fundamental operation of the gas industry—viz., carbonization—is somewhat more modest. The methods and results have not considerably altered in the chemical sense for many years notwithstanding Dr. Bueb; and, apart from carburetted water gas, which cannot be used unless the price of oil is low, no economically possible way has been found of producing a heating gas of high value apart from dry distillation.

We have so far endeavoured to get a more or less clear picture of the difference between the past and the present. It appears to me, however, to be not less interesting to follow statistically and critically the gradual development of our industry. A large number of gas-works have been good enough to place data at my disposal, so that I have been able to draw up diagrams which are now presented to you. The data refer to the years 1858, 1868, 1878, 1888, 1898, and 1908. Thus the development may be followed at intervals of ten years. In calculating the results, the different sizes of the various towns have not been regarded. The figures refer to the average output of forty works.

The first diagram, fig. 1, shows the advance in the retort-house. The make of gas per ton of coal has risen on the average from 8074 cubic feet in the year 1858 to 10,765 cubic feet in the year

1908. But these figures do not fully represent what has been achieved by last year. We can to-day, with the assistance of blue water gas, produce 12,560 cubic feet, and in the vertical retort 12,920 to 13,275 cubic feet of gas of 530 B.Th.U. calorific power. On the average, an advance of about 60 per cent. has

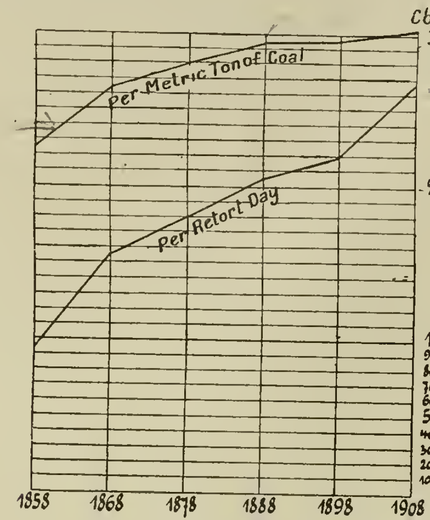


Fig. 1.—Average Make of Gas.

[1 Cb. m. = 35·316 cubic feet. 1 metric ton = 0·984 English ton.]

been made since 1858. The make per retort per diem has risen on the average from 3285 to 9430 cubic feet, or by 200 to 300 per cent. This average, however, does not correspond to the fullest extent with the present position of the industry; for inclined and vertical retorts yield up to 17,660 cubic feet, and chamber carbonizers up to 63,600 cubic feet, of gas per diem.

Diagram No. 2 refers to our most important bye-product—viz., coke—and the different types of setting have been taken as the basis of a comparison, instead of average figures. The topmost curve shows clearly how, as a result of the increasing yield of gas per ton of coal, the production of coke per thousand cubic feet of gas has been falling off—from 145 to 119 lbs. In regard to the consumption of fuel, it attained its minimum with producer settings worked by hand. The rapid increase in machinery has caused it to rise continuously. Thus we have to-day left over for sale only 83 lbs. of coke per 1000 cubic feet of gas, against 91 lbs. at the time of the direct-fired settings, and 107 lbs. at the time of producer settings. This development, however, has served its

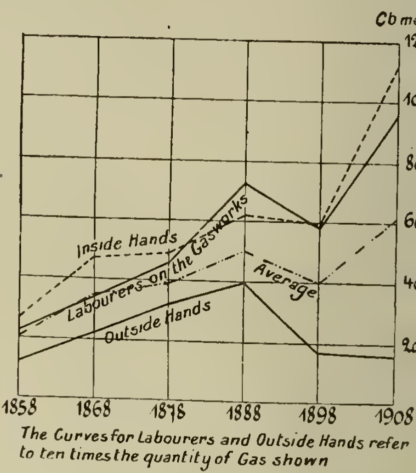


Fig. 3.—Make of Gas per Man per Annum.

[1 Cb. metre = 35·316 cubic feet.]

turn in regard to the price of coke. With reference to the workmen, I cannot give averages, but only the figures for my own Association in Berlin, which are shown in fig. 3. The curves of this table serve to control the performances of the engineers. It will be seen how between the years 1858 and 1888 the work done per head inside the retort-house has been gradually increased to double. Then between 1888 and 1898, on the crest of the new era, there is a small set-back. In the last ten years, however, the

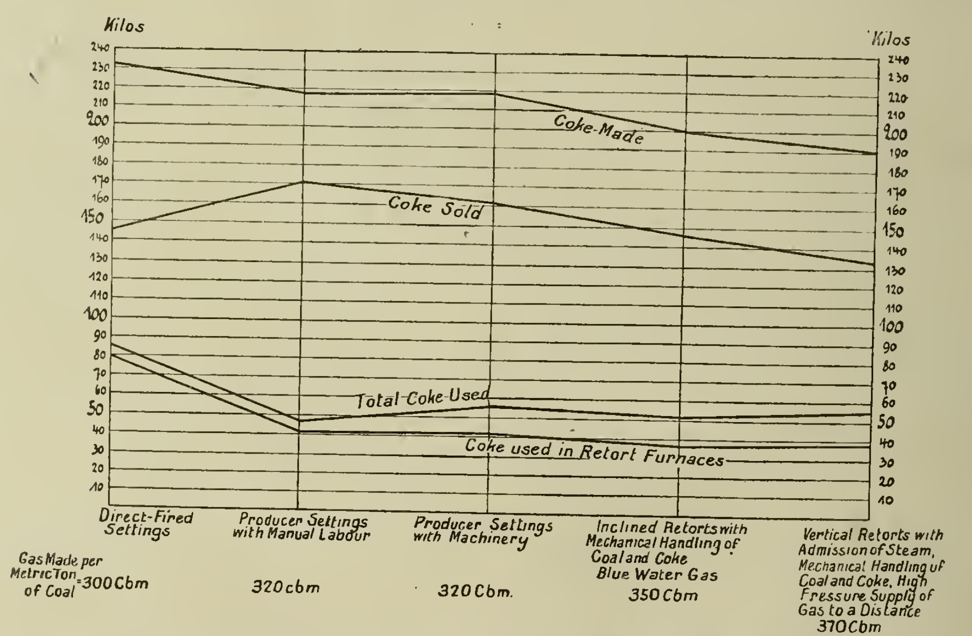


Fig. 2.—Coke Made, Sold, and Used on Works, per 100 Cubic Metres of Gas.

[1 Cb. m. = 35·316 cubic feet. 1 kilo. = 2·2 lbs. 1 kilo. per 100 cubic metres = 0·624 lb. per 1000 cubic feet.]

work done has again nearly doubled, so that in the course of fifty years only a quarter of the number of hands is required for the same make of gas. Almost exactly the same curve applies to mechanics; and with the immense increase in the use of machinery, it is very gratifying to find that only one-quarter of the mechanics formerly required are now necessary. The outside hands, as against those employed inside the gas-works, however, cannot be expected to show a great increase in work per head. In this case the curve indicates the intensity of the Trade Union movement. It is comparatively high in 1858; then falls in 1868-78, to a minimum in 1888; and in 1898 and 1908 returns nearly to its original figure. While, however, without lamplighters, in 1858, there was one man out of doors to five men on the works, we have now four out of doors against five inside.

The full significance of the labour conditions is, however, first realized on comparing the increases in wages which are shown in fig. 4. We have here the interesting result that the average curves are nearly parallel for all classes of labour. The work done per head has about trebled in fifty years. The wages, however, for stokers, for instance, have risen from 2s. to 5s. 9d. per diem. The position of the gas industry therefore is that, economically, not the smallest advance has been made for fifty years. On the other hand, we have been compelled to erect large and costly installations and machinery only to maintain ourselves at the same position.

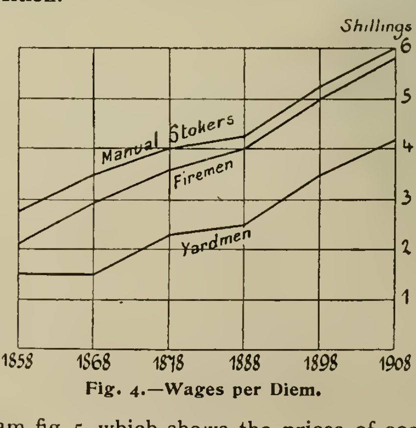
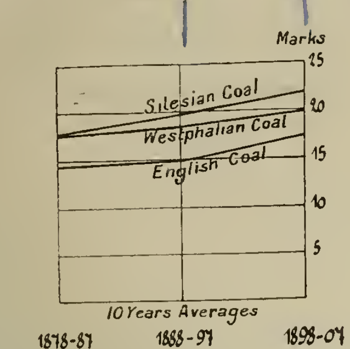


Fig. 4.—Wages per Diem.

The diagram fig. 5, which shows the prices of coal over three



#3 Avg

Fig. 5.—Price of Coal per Metric Ton in Berlin.

[1 mark per metric ton = 12·2d. per English ton.]

decades, affords us still less ground for congratulation. The figures given refer only to Berlin, but must likewise be of fairly general applicability. In the decade 1878-88, Silesian coal cost in Berlin about 17s. per (metric) ton. Ten years later it cost 19s. per ton, and in the last decade, on the average, 22s. That is a rather discouraging state of things. Fig. 6, which shows the net

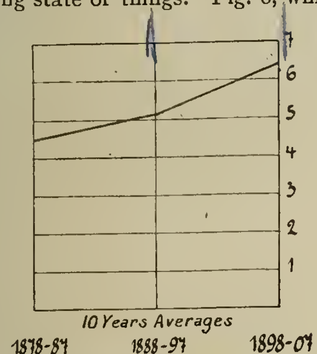
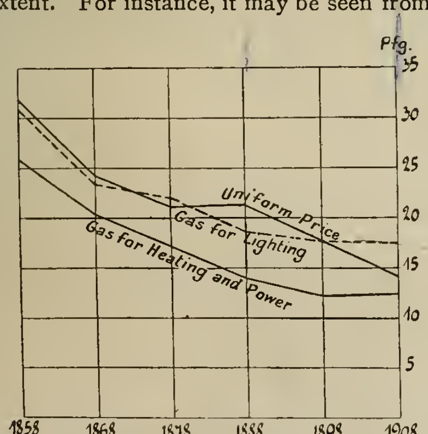


Fig. 6.—Cost of Gas, including Capital Charges, at the Berlin Municipal Gas-Works—Pfennigs per Cubic Metre.

[1 pf. per cubic metre = 3·4d. per 1000 cubic feet.]

cost of gas in Berlin, should be regarded in conjunction with fig. 5. It cannot be merely chance that the cost of gas has moved upwards almost in the same proportion as the cost of coal. Gas in Berlin cost, between 1878-88, 1s. 3¼d. per 1000 cubic feet; between 1888-98, 1s. 6d.; and in the last decade, 1s. 9¼d. In other words, in a quarter of a century, the cost has increased by 40 per cent. Thus all our technical advances are of very little importance compared with the inexorable increase in the price of raw materials, and have only had the result that we are not yet much worse off. In the works under me, I have the whole scale of development before my eyes. Among them is one small gas-works in course of reconstruction which has been maintained just as it was thirty years ago. I can assure you that in this instance the total advance in this period can be placed at 5·1d. per 1000 cubic feet. If the Municipal gas-works had remained stationary at the position of 1878, gas would to-day cost about 2s. 3d. per 1000 cubic feet, or about 80 per cent. more than at that time. We gas men have, therefore, with toil and trouble recovered half the lost ground. Gentlemen, that is a serious, even a very serious, position by which our whole activity is limited to order.

A much more pleasing picture is afforded when we regard the use and distribution of gas instead of its manufacture. Gas as a distributor of light has shown itself capable of development to a surprising extent. For instance, it may be seen from the curves



#6

Fig. 7.—Price of Gas to Private Consumers in Forty Towns—Pfennigs per Cubic Metre.

[1 pf. per cubic metre = 3·4d. per 1000 cubic feet.]

that the cost of a given number of candle-hours is less than one-tenth what it was fifty years ago; and that, correspondingly, the candles obtainable for a given expenditure have been increased more than ten-fold. Even within the last ten years, the light obtainable through gas for a given expenditure has doubled. This enormous gain has fallen into the consumer's lap without trouble to him. If, therefore, gas-works, in order to meet the high price of coal, have of late years obtained rather more gas from a ton of coal and have lowered the calorific power by a small percentage, that is as nothing relatively to the advances in the art of lighting, and is not to be begrudged them.

The diagram, fig. 7, shows clearly the alterations in the price of gas, which has fallen quite considerably. It might be wished, however, that the curve were still steeper. It is interesting that more than ten years ago the dual system of prices was almost exclusively in vogue, and that it is in the last decade that a large number of gas-works have again adopted a uniform price for gas.

The effect of the price of gas and of the advances in the art of lighting has been to develop the output of gas as shown in diagrams 8 and 9. It is especially interesting to notice in

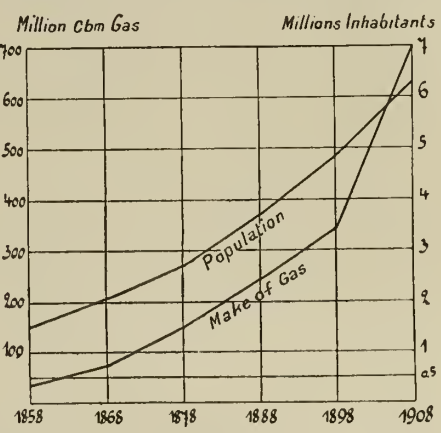


Fig. 8.—Make of Gas and Population for Forty Towns.

[One million cubic metres = 35,316,000 cubic feet.]

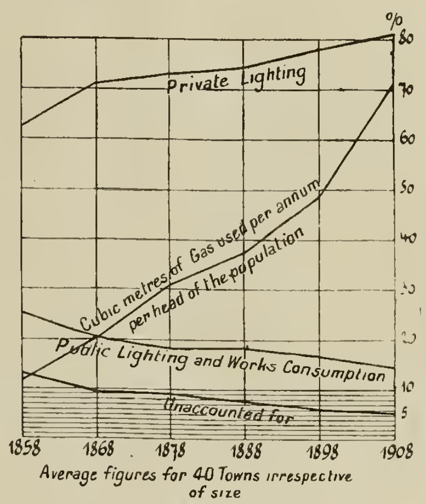


Fig. 9.—Proportions of Gas Used for Different Purposes in Percentages of the Total Consumption.

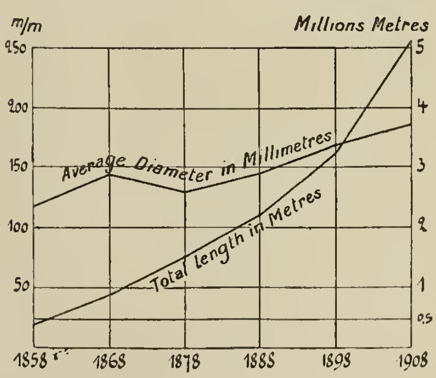


Fig. 10.—Mains Laid.

[25·4 millimetres = 1 inch. One million metres = 623 miles.]

diagram 8 how the gas production has risen more rapidly than the population. Fig. 9 shows how the gas consumed is employed. The percentage for public lighting and of unaccounted-for gas has gradually fallen from decade to decade. The proportion of the total output of gas which is taken by private consumers has risen gradually, so that it is now between 80 and 90 per cent. It is very satisfactory also to notice that the annual amount of gas consumed per head of the population has risen—as is to be seen from the middle steep curve in fig. 9. The next diagram, fig. 10, shows the growth in the length and the diameter of the gas-mains laid.

Gentlemen, you have accomplished in a few minutes a mighty

piece of work. You have set yourselves back in the good old time, and have seen clearly that this Paradise of engineers and of shareholders was bound to be destroyed. You have seen the development which our industry has rapidly undergone in the hard struggle for its existence. Let us stop for a moment's breath and glance backwards as well as forwards on our position. We can say with pride that our industry rests to-day on the broadest and the soundest basis. Gas for heating cannot be displaced for many purposes, and gas for lighting has at the same time developed like the electric light, so that both methods of using gas should find in the household and in industry an extension of use which was unforeseen earlier. On the other hand, we have not hitherto succeeded in reducing the cost of manufacturing gas. Rather the profitableness of the gas industry has diminished. Gas-works and the operations outside the works have become so much more costly and complex, and gas supply takes more and more the character of a modern highly developed branch of industry. If we would therefore maintain the high position of our industry and at the same time continue to develop it, many serious questions crop up which require the best men for their solution. It is, therefore, gratifying to note that a large number of towns have at the present time nominated technical men on their gas and water boards of administration. We could wish that this expansion should become the rule in future, and not only that, but we ought also to set ourselves to attract vigorous and good recruits. Old gentlemen have assured me that the intellectual and social level of our gas engineers has risen on the average from year to year. Diligent, well-directed work from a sense of duty and pleasure is in fact not the exception but the rule in Germany; but, nevertheless, we must not be oblivious. Private industry takes a large part of the active and capable technical men, and in this way draws to itself the greatest proportion of the best intelligence. Who shall prevent us doing the same?

We require relatively to our business an extremely small number of engineers. Let us pay them well, and thereby be enabled to make the highest claims on them and secure the best among good candidates. Let us not forget also that of the many millions which our industry has to spend yearly on orders, nothing is easier than to make an illegitimate profit, and that it must only be expected of a well-paid officer that he will withstand the temptation. If the town possesses a works, it must, if it is to stand at a high level, be worked in a business-like manner and not bureaucratically. The salaries and the freedom of officials must as far as possible be those which prevail in the open industrial market, and the business methods, the selling and buying prices, must be made independent of the councillors assembled round the green table. These are special requirements which, however, present great difficulties of organization. This knowledge is every day coming home to more and more people; and hence it comes about that the eagerness of towns to take over gas-works into their own management is not so great as it was at one time, and that many gas supply contracts are being renewed with private companies. It would, I think, be a great loss for our industry if the spirit of private enterprise were quite excluded from it. The chief reproach which was formerly levelled against gas companies—viz., that they made exorbitant profits—no longer applies to them. If, therefore, companies are struggling for existence or attempting to set up a good business, it is incumbent on them to calculate closely and to use the best technical and commercial methods. They are by their position predestined to take "Forward!" as their motto, and so do a not inconsiderable service to the common weal.

The immense extension of our industry has not taken place without leaving its traces on us technical men. We have been forced to work hard, and I think each of us has worked with might and main. But I cannot help having the impression that our working methods have not yet rightly adapted themselves to the scale of our operations. Those in charge of our large works are not overworked as an exception but as a rule, and where that is the case fault must be found with the organization. The manager is encumbered with too many details. My distinguished predecessor, the eminent Edward Drory, has gone to his grave before my eyes because he felt himself responsible for every detail. How can we help ourselves? I am of opinion that by well-directed decentralization it will be possible for a large number of men to work together and to share the responsibility. When that state of affairs arrives, the young technical man will be required to take pleasure in his work and have intelligence and business ability. The chief will then direct his energies more and more to superintending the quality of the work. He must stimulate the large number of coadjutators and get them to work together for a common goal. But the manager would economize time, and his brain would again on occasion turn to something else besides gas, gas, and always gas!

In conclusion, gentlemen, I wish hearty prosperity to the gas industry. May its curve of development in the next fifty years be as sharply directed upwards as previously, and may the technical men who fifty years hence will be responsible for the gas industry have reason to look back on us with benevolent smiles as engineers who were energetic in their work, and as men who, besides their work, had still plenty of time for humanity and art, for Church and State. Gentlemen, once more good luck to us and our successors.

GERMAN GAS AND WATER ASSOCIATION.

Reports of the Technical Committees.

(*Continued from p. 971.*)

III.—Gas-Meter Committee.

The Committee report that they have been unable to get on as intended with one subject of their labours owing to unexpected delay in obtaining the fabric for the preparation of the artificial membrane for use in the experimental meters. Careful experiments disclosed a trustworthy method for impregnating the raw fabric. Details have been given in previous reports. But this is not the case with the fabric for the new membrane. The Committee considered that they should have some sort of guarantee that the fabric was of a kind and quality suited for the preparation of membrane. They did not, therefore, choose blindly from staple commercial wares, but went back for samples to pieces of fabric which had remained good after more than twenty years' use in meters of System V. Examination showed that this membrane was in part perfectly gas-tight, and only in places somewhat permeable owing less to the fabric than to its preparation. There was great trouble in finding a weaving mill to manufacture the fabrics according to sample, owing partly to no long contract being in question. After protracted negotiations, the efforts made were successful; and there was placed at the service of the works entrusted with the manufacture of the trial gas-meters for the durability tests fabrics which agreed closely with the samples, and which were suitable for the preparation of a durable membrane. The agreement was established by a recognized testing office, which makes a speciality of the testing of fabrics, and the opinion of which can be accepted as of weight. The Committee regret the delay which has thus arisen in carrying out their design, and ask the forbearance of those works which expressed themselves ready to undertake durability trials, in regard to the dry meters for the purpose not having yet been delivered to them.

The new weights and measures law was adopted by the Reichstag without the provision that gas-meters in use must be reproved from time to time. It allows at the same time greater freedom as to the float valve in wet meters. In view of the difficulties resulting from these valves as previously constructed, the Committee have considered their abolition in favour of devices by which the water-level can at any time be seen from outside. These devices, however, did not fulfil the requirements of the Standards' Commissioners. The Committee had deferred the question of a reduction in the fees for stamping meters pending the settlement of the weights and measures law; but it now recommends the Council to take it up with a view to relieving the industry of a too oppressive impost.

The Committee have considered the standardization of sizes of meters, so as to make those of different makes more readily exchangeable than at present. Dr. Leybold has measured the most prevalent sizes of wet gas-meters as made by seven different works; and from the tabulated measurements, it appears that the divergences from the mean figures are not considerable. It may therefore be hoped that small changes presenting no special difficulties may be agreed to by the meter makers, in order to secure the advantage of uniform outside dimensions for all makes of gas-meters of the same capacity. Importance is attached also to unification of the meter-unions. The Committee are negotiating with firms of meter-makers in regard to these points.

Owing to the engagements of members, the Committee have only been able to sit twice, and on each occasion had the advantage of the collaboration of Dr. Meyer, the representative of the Imperial Standards Commission. Of the sum of 500 marks (= about £25) granted to the Committee last year, only 322·9 marks have been expended. The Committee propose to continue work on the questions dealt with in their report. They asked for and obtained a grant of 600 marks (= about £30) for their expenses during the ensuing year.

The report is signed by Herr C. Kohn, of Frankfort, the Chairman of the Committee.

IV.—Committee on Working of Water-Works.

The Committee have thoroughly studied the provisions of the scheme for a new water law promulgated by the Prussian Ministry of Agriculture. After a sitting in Leipzic in October last, they held a joint meeting, with other interested bodies, in November in Berlin. As a result of these deliberations, the Committee compiled a statement of the views and wishes of the Association in regard to the projected water law, which, after a few changes, was transmitted in January to the Prussian Ministry of Agriculture with a covering letter suggesting that opportunity should be afforded for representatives of the Association to discuss the matter with the Minister.

The Committee have been busy collecting data for the twentieth issue of their volume of water statistics, in regard to which it sends out 514 sets of questions to water undertakings. Answers have already been received to 374 sets. In view of the fact that the "Statistical Annual" of German Towns contains particulars of water-works, the Association asks the co-operation of members in furnishing it with the required information promptly, so that its own compilation may be the first in the field.

The Committee are still investigating the question of fractures of town water-mains, and cannot yet give any definite conclusions.

thereon. They are obtaining information from a number of managers of gas and water undertakings. It has been decided to include in the forthcoming volume of water statistics particulars of the population of the districts supplied, details as to the boiler grates and methods of stoking, and whether the boiler fuel is examined periodically and, if so, with what result. Particulars are also being asked for in regard to plant for the removal of iron from water, with details of the amounts present in the untreated water and in the filtrate, and its state of combination.

The report is signed by Herr Reese, of Dortmund, the Chairman of the Committee.

V.—Electrolysis Committee.

This Committee have not carried out work on their own account this year, because the "United Vagrant Current Commission" had not yet completed its labours, and questions brought before the Committee were also referred to it. The full report on the investigations completed before the formation of the aforementioned Commission has not yet been finished, owing to Herr Besig, the Engineer who is compiling it, having been much engaged in the work of that Commission. It is so far advanced, however, that it will soon be completed; and in view of the general interest which it is likely to arouse, it has been decided to publish it as an independent *brochure*. Investigations are at present being carried on at Warsaw, Beuthen, and Düsseldorf—Warsaw has been chosen as a large town in which there was no electric tramway at the time the investigations were started. Researches have already been carried out at Brunswick, Nuremberg, and Cassel. It is hoped the United Commission may be in a position to formulate its conclusions within twelve months.

The report of the Committee is signed by Mr. W. H. Lindley.

VI.—Instructional Committee.

This Committee have not undertaken any new work during the year, but have been content to follow up their previous efforts. Instruction in methods of lighting and in the working of gas-works may be divided into the course for graduates at the Technical College at Carlsruhe and the training for gas-fitters and foremen given at various technical schools. As regards Carlsruhe, students who intend to take up the gas industry for their vocation find here a course of study of which details have been given in earlier reports. Commonly, however, engineering students do not, until their academical studies are finished, decide to turn to the gas industry, and they then require special training for it. A course has therefore been established, extending over two academical half-years, for those who have already received general engineering training and wish to devote themselves to lighting or the gas industry. At the present time, twelve students are taking this course. There is also a fortnightly holiday course for persons engaged in the gas industry. This is held in March; and in the last one, 33 gas managers and engineers participated.

The syllabus of the course is as follows: The mornings of the first and of part of the second week are devoted to lectures by Professor Bunte on the "Technology of Gas Manufacture and the Use of Gas for Lighting and Heating Purposes," and by Professor Eitner on the "Methods of Examination of Coals, Gas, Bye-Products of Gas Manufacture, Boiler Feed-Water, and Lubricating Materials, as well as Calorimetry and Photometry." The afternoons of the first week are devoted to practical laboratory exercises—viz., first day, coal analysis and calorimetry; second and third days, analysis of coal gas; fourth day, analysis of liquor, purifying material, and cyanogen sludge; fifth day, water analysis, and the purification of feed water, and sixth day, photometry and calorimetry of gases. In the second week, there are practical exercises in the Instructional and Experimental Works of the Association, including the investigation of the working of a retort-setting by analysis of the gases, and measurements of temperature and draught, analysis of coal gas, and analytical methods for the control of the washers, purifiers, cyanogen recovery plant, &c., and for the examination of the bye-products, and the testing of the illuminating power, calorific power, and specific gravity of gases and the photometry of lamps of various kinds, including the determination of hemispherical illuminating power. On two afternoons of the second week, the Director of the Botanical Institute of the College (Herr Klein) teaches the principles of the bacteriological examination of water. Professor Eitner also conducts visits to the gas-works at Pforzheim and Heidelberg for the study of different systems of water-gas manufacture and practical novelties in working.

The Instructional and Experimental Works of the Association are, as their name indicates, intended partly for instructional purposes; and illuminating engineers who are qualified, by having passed through the full special course at the Technical College, are admitted to assist in the scientific operation of the works. They thus gain familiarity with plant and the scientific investigation of practical questions of gas manufacture.

At Altenburg, half-year courses of training for gas and water fitters are held, which include visits to several gas-works, and a few weeks practical working in one of them. At Bremen, three courses of instruction for gas fitters and foremen are held; the attendances this year numbering 35, 39, and 50. Opportunity was afforded for practical experience on small and moderate-sized gas-works. There was also a course of instruction in the erection of retort settings, attended by 9 pupils. At Breslau, a course of training for fitters has been started, primarily intended for pupils under 17 years of age. It extends over three years, and occupies six hours a week. There are now 42 pupils. At Cologne, there has been for the past two years a course of instruction for gas, water, and electricity fitters, held in connection with the United Royal Engineering School. The course extends over only three months, of which the first is devoted to preliminary instruction, and the last two to the special technical training. Difficulty has been experienced in the lack of general and technical education of many of the pupils who enter for the course. Admission to the course has been limited to those having some practical acquaintance with gas-works and knowledge of gas manufacture, and other persons desiring to avail themselves of the course merely to secure some small official post have been refused. At Dessau, the school established by the German Continental Gas Company now only gives a course of four weeks' instruction in the erection and working of vertical retorts. At Munich, a course of instruction on three evenings of the week, from 6 to 9 o'clock, was given, starting in October and ending in April. There were 27 pupils, of whom 16 were employed on the gas-works, and 11 in private workshops.

The report is signed by Dr. W. von Oechelhaeuser, the Chairman of the Committee.

VII.—Committee for the Instructional and Experimental Gas-Works.

After a reference to the book value of the works and the provision of the capital, this Committee report that some changes which had been found desirable in the plant were considered. A gasholder capable of holding one day's output of the plant was needed, and the town of Carlsruhe was asked to provide a further strip of land adjoining the present works as a site for the holder. The Corporation gladly granted the necessary land, for which the Committee express their sincere thanks. The plant has also been overhauled with a view to more rapid working. By reducing the duration of time required for an investigation, the capacity of the plant could be raised, and a great saving of material, wages, and superintendence effected. This has been done, *inter alia*, by effecting experimental changes more quickly, and establishing conditions of steadiness sooner after making a variation than was formerly possible.

In regard to the work accomplished, attention is first directed to the report on the Chemical Examination and Carbonizing Tests of German Coals. These coals were mostly obtained direct from the pits; and in several cases the freight was defrayed by the colliery owners or syndicate. There has, however, been some difficulty in obtaining a sufficiently representative number of Silesian coals. A new phase of the work was, however, entered upon in the autumn of 1908—viz., an attempt to formulate a method for the industrial valuation of gas coals. The Industrial Alliance of Cologne provided waggon loads from different gas-works of 19 gas coals from the Rhenish-Westphalian coal field as typical of the consignments received. Similar samples of consignments of Saar and English coals will follow for comparison. The object is to find a basis for the comparative valuation of the different coals with a view to fixing the prices to be paid for them according to their true relative industrial value. The examination of gas coals for the time being is keeping the staff and plant pretty fully engaged, and much other interesting work has been deferred. A number of coals, however, have been examined for private persons or firms, who have defrayed all the costs of such examination.

It is recorded that the firm of J. Pintsch, of Berlin, have (free of charge) replaced the old station-meter by a new recording one; the firm of Junkers have presented one of their latest pattern automatic calorimeters in place of an older one. Other apparatus has been given from various quarters for use at the works.

Chemical and calorimetric testings of a large number of samples of coal and coke have been made, and many lamps and burners have been tested photometrically. The works have also carried out an exhaustive investigation of the working of the Bolz vertical retort installation at Trieste, on which a report has been issued. Other matters investigated include the use of coke-oven gas for the supply of towns for lighting, heating, and power purposes, the suppression of smell in the revivification of fouled oxide, and the depreciation of water-gas plant. The report also refers to the instructional work conducted at the Experimental Works, already mentioned in the report of the Instructional Committee.

Several changes have been made in the staff of the works. Dr. Henseling, who had been in charge of it since 1907, retired, to take up other work, in May last, and Dr. K. Bunte (a son of Professor H. Bunte) was appointed to succeed him. Dr. Spreng left the works for an appointment at the Dantzic Gas-Works, and Herr Schilling took his place. On May 1, Herr Sentke, an Assistant-Engineer at the Chemical-Technical Testing and Experimental Works of the Grand Duchy of Baden, joined the staff of the Association's works.

The report is signed by Herr F. Reichard and Professor H. Bunte, by whom the works are controlled for the Association.

Wood preservation in the United States in 1908 required over 56 million gallons of creosote and nearly 19 million pounds of zinc chloride, with small quantities of crude oil, corrosive sublimate, and other chemicals. Nearly seven-tenths of the creosete was imported—mainly from England and Germany.

A FRENCH RETORT CHARGER-DISCHARGER FOR SMALL GAS-WORKS.

A system of charging and discharging retorts, the invention of M. Villain, was the subject of a paper by M. Bitard read at the recent meeting of the Société Technique du Gaz. He describes in words the working of the machine shown in the illustration, but such a task is not too easy or too interesting without the aid of diagrams and explanatory drawings or photographs. However, our summary of the paper will give its most salient features.

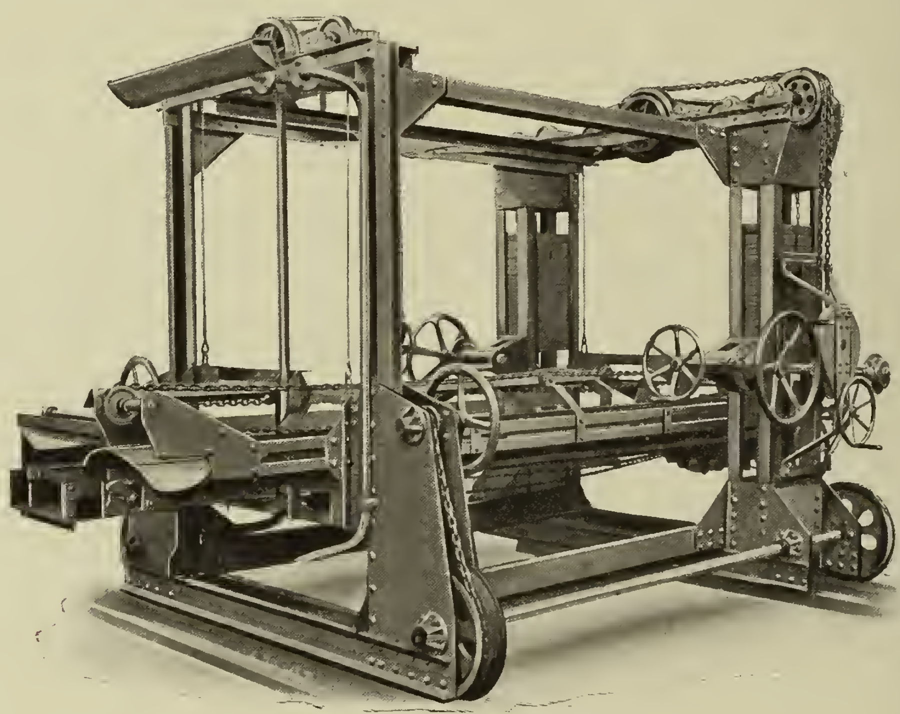
M. Bitard remarks that up to the present charging and drawing machines have been used at only very large works. They are generally operated by motors which make them rather expensive; they necessitate costly mechanical plant for conveying coal to them; and they require a special staff to attend to them. It would be of great advantage to have mechanical charging and discharging available for even the smallest gas-works. He has accordingly directed his attention so as to have the most suitable mechanisms to ensure perfect carbonization owing to the best possible distribution of the coal in the retort, and to allow of the heaviest charges being put in. Simplicity and smoothness of working were also aimed at.

The two appliances are worked by hand-wheels or handles. One man is enough for working them, as the accessory mechanisms are automatically thrown in and out of gear. The question of cheaply feeding the machine with coal was gone into; and an excellent method of supplying the charger with coal from a skip was found. It is also exceedingly practical. The skip is hung on a travelling trolley on an overhead mono rail. A heavy load can thus be easily moved. The type of skip adopted has three compartments, each containing one charge. Three charges are thus carried in one journey; the loading being done once and for all in the coal-stores.

Charging Apparatus.

The principal organ or charging scoop consists of a very extended plate of flattened U shape, which holds the coal. The scoop is divided into a certain number of compartments by cross partitions, fastened by hinges on to a beam in the centre of the cross section, and controlling throughout its length the scoop to be filled with coal. These partitions are arranged so as to lean towards the front of the scoop. The beam is independent of the scoop, and is supported at the back end by a small carriage. There are therefore two distinct parts: (1) The scoop itself; (2) all the door-partitions, of which the carriage occupies the back position, behind that which holds the coal.

The apparatus works as follows: The scoop being filled with coal throughout the length of its partitions, the scoop and the door partitions are together driven into the retort. When the front of the scoop arrives at the bottom of the retort, a special arrangement hits against the back of the carriage partitions, and keeps all this system in place in the retort while the scoop itself is brought back. On the return, the charge of coal which is kept in position by the partitions is run off the front of the scoop as it is withdrawn. The partitions have no other object than to weaken the effect of the filling of the coal, which would tend to be brought to some extent to the front of the retort. When all the coal has been thrown off into the retort, at the moment when the front of the scoop passes the fixed partition, the set of door-partitions is brought back to again take up its former position in the scoop.



Villain's Retort Charger-Discharger.

Accessory mechanisms consist in the series of abutments of the partitions, and their automatic return. Without describing these in detail, it may be said that the former consist of a cross bar on the back of the carriage door-partitions, a rack fastened on the front of the scoop, with notches against which the bar strikes so as to free the whole system. The latter is effected by means of chain tackle being brought into play at the moment when the whole of the coal is thrown off into the retort, and the scoop has a certain length to go before reaching a position of rest. The working of the pulleys actuating the movements of the scoop is fully described in the paper.

The scoop is supported by a framework which can be raised or lowered by a windlass to suit the different heights of the retorts. This framework is common to both the scoop and the rake of the discharging part of the apparatus. It consists of two frames with gusset plates in the intervening space, between which the travelling rollers run for moving the machine longitudinally from one retort to the other. The suspension ropes are fastened to the upper cross-bars of the framework. The scoop is guided in the direction lengthways of the retorts by means of rollers. At a given moment, when it has entered a certain length into the retort, all the front of the scoop is swung beyond the control of the rollers on the frame. To avoid any swinging, a fifth roller running on the floor of the retort is arranged under the front of the scoop.

The movement of the scoop is minutely detailed by the author. It is effected by a chain working over a pulley and driven by a hand-wheel, which by a special arrangement is kept always at the same height from the ground, for convenience in working. The introduction of the scoop into the retort is managed by a second wheel; and it takes less effort to effect it than to withdraw the scoop from the retort, as in the latter case there is the friction with the coal to be overcome.

The charge of coal put in the retort by the machine is thinnest on the cross centre line, while the layer is as high as possible along the sides of the retort. This ensures the greatest possible width of contact, and achieves the most advantageous section.

The scoop is charged either by shovel or by a skip. In the latter case, the coal can be spread partly automatically as the scoop is entering the retort.

Drawing Apparatus.

The drawing rake consists of a set of three hinged plates fastened at the end of a rod, so that they may take up the least possible room in passing over the coke in entering the retort, and yet at the end can take hold of the bottom of the charge and draw it out. It is the middle plate that has the adapting hinge; the other two side plates being made so that they can turn within a limited angle. The cross contour of the three plates is such as to conform with the arch of the retort while entering it. At the bottom of the retort, the side plates open out under the pressure of the mass of coke, which produces an enlarging effect, so that all three plates fill the width of the retort. The middle plate controlling the side ones is raised or lowered by means of a connecting rod to which it is fastened; the rod being also connected to the end of the working rod. The parts played by these two rods are fully described in the paper, as well as several ingenious mechanical devices in relationship with them.

The methods of support and of movement of the drawing apparatus are similar in principle to those already mentioned for the charging machine. The rake is supported at the back by two flanged rollers, the axle of which is fastened to the end of the rod. At the front is another roller, on which the rod rests. The method of balancing the rake is also similar to that used for the charging apparatus; but as the additional roller could not run over the surface of the coke, a path for it is provided by means of a special bar running alongside the rake rod.

The moving power is transmitted by an endless chain, passing over one pulley at the front and one at the back. When the rake is in position in front of a retort, the sustaining bar is first run to the bottom and then the rake itself is admitted. When it has got to the end of its stroke and the lowering of the plates has been done, the sustaining bar is brought back. Then the rake is worked so as to bring out the charge.

The hand wheels and windlass are the same as are described for the charging portion of the machinery. The frame is kept in equilibrium by two counterbalance weights, with chains working over a drum.

The apparatus is completed by a quenching arrangement fixed on the framework above the position for the coke waggon, and so that the drawing rake also can be cooled on coming out of the retort.

LYONS ELECTRIC AND POWER SUPPLY WORKS.

In the course of the notes which appeared last week on the visits paid by the members of the Société Technique du Gaz to the works of the Lyons Gas Company, on the occasion of the holding of the thirty-sixth annual congress in that city, it was mentioned that the Company's electricity stations were also inspected. It may be of interest to give some particulars of these establishments, to supplement those which have already appeared in regard to the gas-works.

The Company possess four stations, named respectively the Gazomètre, Pazzi, Rambaud, and Tronchet. The first three have each a section producing current by means of steam-driven plant, and another for transforming the current furnished by the Société Grenobloise de Force et Lumière, to which further reference will be made later; while the last is used exclusively for the transformation of the surplus continuous current of the Omnibus and Tramways Company, delivered at a pressure of 600 volts. The three-phase current at 50 periods of the first-named Company is brought to 10,000 volts at their transformer station at Vaulx-en-Velin, in the suburbs of Lyons, and delivered by underground cables to the gas-works at Villeurbanne, whence it is sent first to the Gazomètre station and afterwards to the Pazzi and Rambaud stations—the latter being at the head of the suburban network of cables. The three-phase current received by the Gas Company is transformed into continuous current at 230-260 or 260-290 volts. The current produced by the stations themselves for feeding the urban cables is continuous, at low tension. When the current from the Power and Light Company fails, the Gazomètre and Rambaud stations are capable of generating three-phase currents at 10,000 volts (50 periods) for the suburban canalization. When the current reaches the various communes it is distributed on the four-wire system, after having passed through static transformers which lower the pressure either to 208 volts for motive power, or to 120 volts for lighting purposes. In order to ensure perfect regularity of the service, the stations are furnished with powerful batteries of accumulators, which have acted so well that there has been no interruption of the current since the first machine was started in 1888, notwithstanding a few accidents which cannot be avoided in the most carefully conducted works. With these prelimary remarks, we will proceed to describe the different stations.

The oldest and most important station is the one named after the street in which it stands—the Rue de Pazzi. It is situated in the centre of the city, in an old quarter, in which the streets are very narrow. It was equipped in 1887; but it has since undergone considerable improvement, especially in 1898, when the Gas Company's concession was renewed. The production of current is ensured by seven groups of generators, representing a total of 2700 H.P. (1800 kilowatts), consisting of compound condensing engines coupled direct to shunt dynamos with interior poles, supplied with steam by eight coke-fired Naeyer and Niclausse boilers, having a total heating surface of about 18,000 square feet. There are five accumulators—two equal respectively to 1600 and 3400 ampère-hours, and the others equal to 4140 ampère-hours each. The portion of the station devoted to the transformation of the current is furnished with three groups of transformers, composed of a three-phase Thomson-Houston motor of 500 H.P. at 500 revolutions, coupled up to a Thury dynamo of 300 kilowatts. These machines are so arranged as to give sufficient pressure to charge the accumulators without the interposition of boosters.

The Gazomètre station is situated on the left bank of the Rhône, in the Guillotière quarter. It was established in 1898. As in the case of the Pazzi station, it consists of two sections—one for the generation, the other for the transformation of current. The former is effected by five groups of continuous-current generators of from 260 to 290 volts, having a total capacity of 2500 H.P. (1700 kilowatts). The most powerful of them works with superheated steam at 250° C., and it can furnish either continuous current at 260–290 volts by a dynamo, or three-phase current at 10,000 volts by means of an alternator. Steam is generated by seven coke-fired Niclausse and Bonnet-Spazin boilers, having a total heating surface of 14,430 square feet. The station is provided with two batteries of accumulators—one of 162 elements of 1100, the other of 160 elements of 1380 ampère-hours. The receiver portion of the station has two rotary transformers, of 500 H.P., running at 500 revolutions per minute, each composed of a three-phase motor of 10,000 volts, driving a 300-kilowatt continuous-current Thury generator, the pressure of which can be raised sufficiently to charge the accumulators without the interposition of boosters.

The Rambaud station is close to the Perrache works of the Gas Company. It is of comparatively recent construction, and has been arranged for the production simultaneously of three-phase and continuous currents. It contains four groups of generators, two of 50 H.P. (40 kilowatts) and two of 250 H.P. (170 kilowatts), capable of producing either continuous current at 230 to 260 volts for the supply of the immediate neighbourhood, or three-phase current at 140 to 160 volts, the pressure of which is raised to 10,000 volts by three transformers of 115 kilowatts. The two coke-fired boilers at the station have a total heating surface of 3874 square feet. From this station is obtained the current required for driving plant at the gas-works.

The Tronchet station dates from 1900. It contains two rotary transformers of 125 kilowatts, each composed of a motor of 190 H.P., worked by current obtained from the Omnibus and Tramways Company, actuating a continuous current dynamo of 260 to 280 volts. Its pressure may be raised to 400 volts for charging the two accumulators, each of 154 elements of 1100 ampère-hours. This operation may also be effected directly by the Omnibus Company's current by employing a step-down transformer.

The network of cables is composed first of all of various feeders starting from the four stations. They are 16 miles long, and supply cables which, in Lyons alone, extend to 66 miles. From the urban network of mains more than 10,000 lighting consumers, using 170,000 lamps of 10-candle power, or their equivalent, and a certain number of power users, are supplied. It may be noted that the 23 feeders from the Pazzi station constituting the principal distributing plant of the Gas Company, do not all work in parallel, but are divided into five groups, in order to minimize the risk of interruptions of the supply in case of accident. The suburban network consists of nearly 40 miles of high-tension and 120 miles of low-tension cable. But it is continually being extended *pari passu* with the development of the works and the acquisition of fresh concessions by the Company. The electric lighting of the city, which is confined to some of the principal thoroughfares, is in the hands of the Société Lyonnaise des Forces Motrices du Rhône and the Gas Company. The latter furnish current for about 80 arc lamps, a certain number of which are placed upon candelabra arranged for simultaneous lighting by gas and electricity.

The station of the Motive Power Company just referred to is situated on the Canal de Jonage, at Cusset, in the outskirts of Lyons. The canal is an arm of the Rhône, and it took four years—from 1894 to 1898—to construct. It is 11½ miles long, and from 200 to 330 feet in width. The volume of water derived from the Rhône varies, according to the height of the water, from 22,000 to 35,500 gallons; and the depth of the fall at the Cusset works is from 30 to 40 feet. The canal was conceded to the Company on July 9, 1892. A compensating reservoir about 400 acres in extent serves for the storage of water during periods of small consumption, and facilitates the regular running of the works. The hydro-electric plant consists of three exciters of 260 H.P. and sixteen turbines of from 1260 H.P. to 1600 H.P., actuating 16 three-phase alternators of similar power. The electric energy is distributed in Lyons and to the suburban communes by means of a primary network of cables at 3500 volts, and by a secondary network at 110 volts. The length of the underground conduits is 315 miles. In the twelve months ending Dec. 31 last, the works produced current equal to 432 million hectowatt-hours. At present the Company supply 3307 customers with motive power equivalent to an installation of 24,244 H.P., and 9466 lighting customers using 247,400 lamps of 10-candle power. The total revenue of the Company last year was £191,800.

In an earlier part of this article, reference was made to the Société Grenobloise de Force et Lumière. The Company have five stations, the capacities of which range from 4000 to 10,000 H.P. At one of the stations, the depth of the fall of water is 75 feet, and at another about 215 feet. The Company's overhead distributing lines extend to a length of 420 miles; and they transmit either three-phase current (50 periods) at 26,000 and 40,000 volts, or continuous current at about 50,000 volts. The centres of distribution are mainly in the industrial quarters; the Company's principal customers being the Tramways and Gas Companies. The motive force subscribed for is equal to 18,000 H.P. The Company supply about fifty rural communes.

It should have been noted last week that, among the "King's Birthday Honours," was the conferring of a knighthood on Mr. R. H. Inglis Palgrave, F.R.S., the Chairman of the Great Yarmouth Gas Company, the Editor of the "Dictionary of Political Economy" and a noted writer on banking subjects.

ORIGIN AND PROGRESS OF GAS LIGHTING.

Paper by a Former Norwich Gas Manager.

The occupancy of the presidential chair at the recent meeting of the Institution of Gas Engineers by Mr. Thomas Glover, of Norwich, the account given in his Inaugural Address of the new departure in carbonization which he is making there, and the inspection of his works by the members of the Institution at the close of the meeting, have caused special attention to be turned to the ancient cathedral city in which Mr. Glover's professional duties are discharged. It may therefore not be without interest, as furnishing evidence of what one of his predecessors in the management of the gas-works—a Mr. Tadman—did to enlighten the citizens on the subject of coal gas, to reproduce portions of a paper read by him many years ago on "The Origin and Progress of Gas Lighting." The manuscript, courteously placed at our disposal by Mr. Glover, contains references to two Norwich men who were among the early inventors of plant connected with the utilization of gas.

Among the diversity of subjects which agreeably occupy attention, while they afford a rational gratification to the mind, the most interesting are such as relate to the progress of human improvement. The history of discoveries in science, or inventions in art, must therefore be deserving of particular regard; for Genius is here exhibited unfolding her energies and displaying the variety of her resources. The arts of civilized life so essentially contribute to happiness, that it is natural men should be desirous of tracing them through the various stages by which they have advanced in their career. As the application of so subtle a body as coal gas to the purposes of public and domestic illumination is one of the most singular and happy contrivances of modern ingenuity, some account of its discovery, and the means by which it has been progressively brought into notice, may tend to gratify rational curiosity. It has become a subject so important as to create a high degree of interest; and from the extensive employment of gaslight, which is so clear, soft, and agreeable to the sight, it seems to be peculiarly adapted to the useful occupations, while it conduces to promote the social pleasures and domestic comforts of man. Indeed, it may be asserted that the lustre of its beams dispels to a considerable extent the gloom of night, and restores the cheerfulness of day—exciting those pleasurable feelings that animate to action and to enjoyment.

Formerly the inflammable gases were known rather by the direful effects which they so often produced than for useful qualities. Two of them, which form constituent parts of coal—choke-damp and fire-damp—had been known to miners long before the establishment of the Royal Society; but the earliest notice of either in their "Transactions" is in the year 1667. It is entitled: "A Description of a Well and Earth in Lancashire taking Fire by a Candle approached to it. Imparted by Thomas Shirley, Esq., an Eye-Witness." There can be little doubt that the bright and vigorous flame which the writer described proceeded from what we now call carburetted hydrogen, or coal gas. Some interesting circumstances relating to the properties of coal gas are detailed by Sir James Lowther in a paper in the "Philosophical Transactions" for 1733. The writer of this narration described with remarkable minuteness and precision the principal properties of coal gas as he exhibited them to different members of the Royal Society, and evinced that the gas retained its elasticity and inflammability after keeping it for some time. But, notwithstanding these striking appearances, there seems to be no evidence that the philosophers of that period undertook any experiments with the view of applying it to useful purposes, or even suggested any idea to the world. One of those fortuitous occurrences, however, which have often led to important discoveries, was the occasion of the properties of coal gas being better known and more particularly attended to. The circumstance is detailed in the "Philosophical Transactions" for 1739, in an extract from a letter by the Rev. Dr. John Clayton. He calls the gas the "Spirit of Coal," and discovered that it was inflammable from its having accidentally caught fire by coming in contact with a candle as it was escaping from a fracture in one of his distillatory vessels while he was endeavouring to repair the luting. He carefully enumerated the several substances produced by his distillation; and by preserving the gas in bladders he frequently diverted his friends by exhibiting its inflammability when lighted by a candle. By this discovery of Dr. Clayton, some of the most striking and the most valuable properties of coal gas are displayed. But he seems to have entertained no suspicion of the useful purposes to which the gas has since been applied; and, remarkable as were the circumstances which he so minutely and accurately related, it does not appear that they attracted any particular notice at the time of their publication. In 1767, the subject engaged the attention of Dr. Richard Watson, afterwards Bishop of Llandaff, who published the result of his researches in the two volumes of his "Chemical Essays." His experiments show that he examined with great care the products arising from the distillation of pit coal; and he described them with his usual exactness. After detailing a variety of interesting facts and calculations respecting the quantities of coke, tar, &c., produced from various kinds of coal, he put forward several useful queries to excite others to investigate the subject with a view to further discoveries. Dr. Watson's experiments on coal probably caused Lord Dundonald to make the experiments on which his patent was taken out for manufacturing mineral tar.

Hitherto we have had only a faint glimpse of that beautiful light which at a future period was destined to be exhibited in such splendour, and to be so extensively subservient to the public benefit. However, both art and science are in their nature necessarily progressive. Thus the advantages to be derived from the useful qualities of coal gas were not obvious to those who first discovered them; and many years elapsed before they were distinctly perceived and duly appreciated. Mr. Murdoch, of Soho, has the singular merit of being the person who first applied this gas to any economical purpose; and he also exhibited the mode in which it might be employed, instead of lamps or candles, for all the useful purposes of artificial lighting. In the year 1792, he used coal gas for lighting his house and offices at Redruth in Cornwall; and in 1797 he again made a similar use of it at Old Cumnock, in Ayrshire. At that large establishment, the Soho Foundry, near Birmingham, in 1798, he constructed an apparatus which enabled him to exhibit his plan on a larger scale than any which he had hitherto attempted. His experiments were sedulously continued with a view to ascertaining not only the best modes of making, but also of purifying and burning, the gas, so as to prevent the smell and the smoke from being offensive.

Mr. Murdoch had many difficulties to overcome before he attained perfection. But, as he united scientific knowledge with great practical skill, his perseverance enabled him to triumph. The retort he first used was similar in form to the common glass retorts usually employed in chemical experiments. He next made trial of cast-iron cylinders, which he placed perpendicularly in a common portable furnace; and they were calculated to contain about 15 lbs. of coal. In 1802, however, he had recourse to the horizontal mode of setting them. In 1804 and 1805 he varied his plans, and constructed his retorts with an aperture door at each end—one of them for introducing the coal, and the other for taking out the coke. But this method he found both inconvenient and troublesome. In the works which were constructed in 1805 and 1806 for Messrs. Phillips and Lee at Manchester, he tried a retort of a different kind, which was very large, and had the form of a bucket with a cover to it. Into this a loose grate or iron cage was introduced for the purpose of holding the coal; and by this contrivance the whole of the coke could at once be heaved out of the retorts when the carbonization was completed. This was so capacious as to contain 15 cwt. of coal; but afterwards smaller sizes were tried in an elliptical form. These were found to answer much better.

Though Mr. Murdoch engaged in his experiments on coal gas so early as the year 1792, and in some subsequent years had even applied it to lighting up his office at Redruth and Cumnock, as well as at Soho Foundry, he made no effort to excite the attention of others to the subject till he was prompted to that remarkable exhibition of it at the Peace of 1802. Previously, however, to this public display by Mr. Murdoch, gas had been applied to similar purposes by M. Lebon, of Paris. This is important in the detail of its history; but it does not detract from the merit of Mr. Murdoch, nor lessen his claim to the honour of being the first person who introduced the application of gas to useful purposes on a large scale in this country.

In 1803 and 1804, Mr. Winsor, who had laid claim to gas lighting as his discovery and invention (though probably he derived all the information he possessed relating to gas chiefly from Lebon, whose assistant he had been for some time in Paris) publicly exhibited his plan of illumination by coal gas at the Lyceum Theatre in London, where he delivered lectures on the subject, which he illustrated by a number of experiments. He afterwards removed his exhibition to Pall Mall, where, early in 1807, he lighted up a part of one side of the street. This was the first instance of this kind of light being applied to such a purpose in London. He was also the projector of a National Light and Heat Company. Having obtained a patent for his plan, he published some pamphlets to recommend it. It has been stated that Mr. Winsor raised nearly £50,000 by subscriptions for establishing his Company; but, large as was the amount, he was not enriched by it, for the whole was expended upon his projects. In proportion as gas lighting occupied more of the attention of scientific men, the illuminating and other qualities of gas became more frequently the subject of discussion. The advantages and inconveniences attendant upon its use as a medium of light were rigidly examined and scrutinized; and every examination rendered its importance and utility more strikingly evident.

In the year 1805, Mr. Samuel Clegg, having left Soho, directed his attention to the construction of gas apparatus; and the first he erected was at the cotton mill of Mr. H. Lodge, near Halifax. His practical knowledge and ingenious contrivances not only contributed to improve the practice but to give an impulse to the more general adoption of this mode of illumination. In 1806, Mr. Josiah Pemberton, a very intelligent and ingenious man, had employed himself for some time in the contrivance and construction of gas apparatus. The first that he erected in the way of business was for Mr. Mark Saunders, an eminent button manufacturer; and its purpose was not only to light his manufactory, but also to afford the necessary heat for soldering the shanks of buttons. It so completely attained its object that it was in use

for more than twenty years afterwards with no alteration; and it required very few repairs. In 1808, he also constructed and fixed a gas apparatus that was applicable for several uses for Mr. Benjamin Cook, a manufacturer of brass tubes, gilt toys, and other articles in which a great deal of soldering was required. This answered its purpose so well that Mr. Cook gave an account of it in "Nicholson's Journal." In the course of the same year, Mr. Pemberton erected other apparatus for different manufacturers and to serve for various purposes; but soon after this he discontinued the business of manufacturing gas apparatus.

The year 1809 was memorable as the era when the first application was made to Parliament for an Act to incorporate a gas company for the purpose of more effectually and beneficially carrying on its processes. This is a remarkably important fact in its history; for it was the foundation of the "London and Westminster Chartered Gaslight and Coke Company." The capital proposed to be raised at that time was £200,000; and this sum was stated to be fully adequate to effect all the objects they then had in view. The persons who applied for the Act to form them into a company had many difficulties to combat, arising both from interest and from prejudice. Their projects were represented as visionary, and the execution of them attended with considerable danger; and hence some alarms were excited which, in conjunction with various other causes, operated against the success of their application. They were opposed by Mr. Murdoch, on the ground of priority of right to the discovery, which entitled him to exclusive privileges if he chose to avail himself of the advantage; and this gave rise to a long and minute investigation before a Committee of the House of Commons. The evidence of Messrs. Accum, Humphry Davy, Lee (of Manchester), James Watt, and many other persons, was heard as to some of the minor points; and much useful information was obtained. However, the application terminated unsuccessfully; and it was attributed at the time partly to the impressions produced by the puffing extravagances of Mr. Winsor, and partly to the defective and erroneous evidence of Mr. Accum and others. Though in one attempt the applicants had failed to obtain legal power and authority to carry their extensive scheme into effect, their pecuniary interests in its success stimulated them to make further efforts. Consequently, in 1810 another application was made by them to Parliament; and though they encountered some opposition, and also incurred considerable expense, they succeeded in obtaining an Act to authorize His Majesty to grant them a Charter within three years from the time of the passing of the Act. Thus by perseverance the persons who were engaged in this great speculation succeeded in attaining the leading point they had so anxiously sought; and Mr. Winsor's plan of a National Light and Heat Company was in part accomplished by the legal formation of a local gas company.

On April 30, 1812, a Charter was granted to the Gaslight and Coke Company which enabled them to become a body politic for the term of 21 years, subject to the provisions and restrictions contained in the Act of 1810. Hitherto the labours of this Company had been attended with no profit and with very little fame; but they steadily pursued their plans, and made the necessary purchases of sites for their stations. They first obtained the one in Peter Street, Westminster, then that in Curtain Road, and lastly that in Brick Lane; and in order to extend the means and facilitate the more general adoption of gas lighting, they persevered in laying down the principal street-mains, and making such other preparations as seemed to be essential to the successful accomplishment of their purposes. Early in 1813, they had an opportunity of securing the able assistance of Mr. Samuel Clegg; and under his direction their principal works at all their different stations were erected. From this period various improvements were gradually introduced into almost every part of the apparatus and machinery as they were suggested by his ingenuity and great mechanical skill. Towards the end of 1813, an accidental explosion occurred at the works at Westminster, in which Mr. Clegg was seriously injured. In consequence of this accident, a Committee of the Royal Society was appointed to inquire into the cause of it; and their report was probably conducive to the advantage of both the gaslight establishments and the public.

About this time the City of London Gaslight Company was established; and two others were projected for the Metropolis—one in Southwark and the other in its eastern district. We are now at an era when the current of public opinion was strongly turning in favour of the new mode of lighting; for, as the knowledge of gas had become more widely diffused, the prejudices which had formerly prevented its adoption had been gradually overcome. As the Chartered Company's establishments had been considerably enlarged and were constantly extending, a proportionate increase of pecuniary means became requisite; and consequently, in 1816, they applied for power to augment the amount of their capital £200,000, which they readily obtained. But an additional restriction was imposed upon them, for their proceedings were subjected to the inspection and control of the Secretary of State for the Home Department.

Various considerations at this time induced men of science and skilful mechanics to aim at improving the apparatus employed in the operations of making and purifying gas, several of which exhibited the talents of the inventors. The person who first distinguished himself was Mr. Samuel Clegg. In December, 1816, he obtained the patents for his horizontal retort, apparatus for purifying gas with cream of lime, rotative gas-meter, and self-acting governor. All these were important inventions or improvements; and they essentially contributed to the art by laying the foundation of an improved system of management. Though the gas-meter was the original invention of Mr. Clegg, it has been materially improved by Mr. Samuel Crosley. The experience of several years has proved its advantages, both to the proprietors of gas-works and the consumers of gas; and its utility has been evinced by the regularity and accuracy of the operations by which its purposes are effected.

In the year 1817, Mr. Clegg retired from the service of the Gaslight and Coke Company; but he had then accomplished the erection and arrangement of the great works at their three different stations. During the four years that his abilities had been employed upon them, they had attained such a degree of perfection as to display not only the great capabilities of the art to which he devoted his talents, but also the probable advantages that would eventually be realized by its general adoption. Mr. Murdoch is undoubtedly entitled to the praise of having been the first person who applied gas as a substitute for other means of lighting large private establishments; but the merit of its first application to the illumination of a whole town appears to be due to Mr. Clegg. In the course of 1817, he planned and erected gas apparatus at the Mint. Mr. Brande gives some interesting facts relating to the progress of gas lighting in the Metropolis at this period, which exhibit the rapid and extensive advances then being made. He states that at the three stations belonging to the Chartered Gas Company 25 chaldron of coal were daily carbonized, producing 300,000 cubic feet of gas, equal to the supply of 75,000 argand lamps each yielding the light of 6 candles. At the City Gas-Works, in Dorset Street, the quantity used daily amounted to 3 chaldrons, adequate to the supply of 1500 argand lamps; so that 28 chaldron, or 35 tons, were daily carbonized at that time.

The subject which at this time seems to have excited the greatest degree of public interest was coal gas. The period was indeed prolific in schemes for its improvement; and several persons obtained patents for their respective plans. But its perfection was the object which principally occupied attention; and, though essentially important, this had certainly proved the most difficult to effect. One of the first of the patent plans was devised by Mr. D. Wilson, of Dublin, who, in 1817, obtained a patent for purifying coal gas by the chemical action of ammoniacal gas. Though this method proved efficacious for its purpose to a certain extent, it appears to have been attended with some inconveniences and difficulties, and was therefore never much introduced into practice. Another plan to purify coal gas was devised by Mr. Reuben Phillips, of Exeter, who in the same year obtained a patent for the purification of coal gas by the use of dry lime. This method was found to answer remarkably well; and it was adopted in Norwich at the commencement of the year 1830. Mr. Alexander Angus Croll, of the Brick Lane station of the Chartered Company, further improved the process of dry lime purification. Mr. G. H. Palmer took out a patent for a method of purifying coal gas which differed materially from any of the preceding plans. The gas was passed through iron retorts heated to dark red. These retorts required to be half filled with various oxidizable substances—such as broken pieces of cast iron, iron clippings or turnings, iron ore, or others of a similar nature. To deprive the gas of its sulphuretted hydrogen and carbonic acid seems to have been the primary purpose of this mode of purification; but the patentee had another object in view which was certainly very important—namely, to obviate the nuisance from the lime when saturated with sulphuretted hydrogen. This occasioned much annoyance to those who lived in the vicinity of gas-works. The plan was found to possess great disadvantages. The complicated construction of the apparatus and the nice attention it required might all combine to prevent its extensive use, whatever advantages the plan might seem to present. This gentleman erected the Yarmouth Gas-Works. Another method was suggested by Mr. Samuel Parker, of Liverpool. He did not employ oxidizable substances, but passed the crude gas through an arrangement of iron pipes placed horizontally in a furnace. This plan was tried, but did not answer. Mr. George Lowe, of Derby, purified coal gas by conveying it through an iron cylinder containing iron turnings, afterwards passing it through lime water.

Various plans were patented for the arrangement and setting of retorts. Mr. Perks, of the City of London Gas-Works, obtained a patent for his plan of placing twelve retorts with one in the centre, so that the whole thirteen could be heated at once. Mr. John Grafton, a pupil of Mr. Clegg, took out a patent for some improvements in gas apparatus. A part of his scheme consisted in constructing retorts which were open at both ends and lined with fire-clay. The plan has been further improved by substituting retorts made entirely of this material; and they are used at Cambridge, Colchester, and several other towns which Mr. Grafton has lighted. They are stated to be more economical than iron retorts.

Having pursued coal gas through all its vicissitudes from the earliest accounts of its discovery till 1817-18, and also having shown the various attempts to render it useful till its successful and extensive application was finally accomplished, circumstances intimately connected with the subject of gas lighting necessarily direct our attention to another interesting branch of the art—the introduction of oil gas. In 1815, Mr. John Taylor, a native of Norwich, obtained a patent for apparatus for the decomposition of oil and other animal substances; and as one of the contrivances was to procure gas from oil, the invention excited curiosity and caused a greater degree of attention to be bestowed upon

the subject. From some unforeseen difficulties which attended its operations, the apparatus could not be properly and successfully introduced till several years afterwards. One of the principal of these was the patentee finding that the iron retorts employed in the production of oil gas gradually lost the power to decompose the oil. This remarkable and unexpected change led, of course, to some investigations with the view of discovering the cause; and though the interior of the retorts was cleansed from all extraneous matter, it was still found impracticable to restore them to such a state that they would produce the proper and desired effects. But the experiments to which the circumstance gave rise were productive of the most favourable results, and led to the discovery that, if fragments of broken bricks or coke were introduced into the retorts, their capacity for decomposing the oil would greatly increase. Thus an important improvement was made in the process, and at the same time the serious apprehensions of the patentee were effectively removed. In 1819, Messrs. Taylor and Martineau erected their patent oil-gas apparatus at Apothecaries' Hall. In 1820, they commenced at Norwich; and in 1821, at Hull and Bristol. Leeds, Colchester, Leith, Bow, Whitby, and several other places were lighted from that time up to 1824. Norwich was the first oil-gas works upon a scale for lighting streets and public buildings. The Act was obtained in 1820.*

But to return again to coal gas, which, in consequence of the introduction of oil gas, was very materially retarded. The application of a company to Parliament for a Bill to empower them to light with oil gas the City of London and the Liberty of Westminster, under the style and title of the "London and Westminster Oil-Gas Company," with a capital of £900,000, occupied great public attention. It was submitted to the examination of the most scientific chemists, engineers, and other persons connected with gas-works—viz., Professor Leslie, Mr. George Lowe, Mr. Herepath, Messrs. Christiesou and Turner, and a great number more—who gave their testimony respecting the value of coal and oil gas. After the expenditure of a large sum of money on both sides, the Oil Gas Bill was ultimately thrown out. After the settlement of the question of oil and coal gas—the value of the two gases being finally decided in favour of the latter—coal gas companies again commenced in earnest. From a return made to the Secretary of State in 1822, the following figures are taken:—

	Retorts.	Gas-holders.	Contents.	Coal Used. Chaldrons.	Rental.	Miles of Pipes.
Chartered—						
Peter Street.	300	15	309,385	9,282	£62,364	60
Brick Lane .	371	12	221,131	8,060	£44,790	40
Curtain Road	240	6	90,467	3,336	£18,823	25
	911	33	620,983	20,678	£125,977	125
City of London—						
Dorset Street	230	8	181,282	8,840	£30,839	50
Phœnix—						
Bankside .	164	6	115,675	3,640	£14,962	35
	1305	47	917,940	33,158 = 41,447 tons	£171,778	210

This will show that the three great Gas Companies in London were generating annually 397 million cubic feet of gas to supply the number of private and public lamps. In addition to these Companies, at that time the Imperial Gas Company were erecting at their Hackney station two gasholders of 10,000 cubic feet each, and were about to erect four more of the same size; while at their Pancras station, they had marked out ground for six gasholders of 10,000 cubic feet each.

Great numbers of companies which have been formed during the last few years for the purposes of gas lighting are cogent and striking proofs of the favourable opinion generally entertained of it. Almost every town of any importance in the United Kingdom has now one gas-light establishment and some of them more. The practice is now extending, and it is understood that more than 400 public gas-works are at this time in operation. I shall therefore briefly mention the Gas Companies at present established in London to show the great increase of gas lighting since the year 1822. The following are the names of fifteen Companies in operation in 1844:—

Companies.	Works.	Rental per Annum.	Coal Carbonized. Tons.
Chartered . . .	3	£175,000	70,000
Phœnix	3	60,000	50,000
Imperial . . .	2	120,000	60,000
British	2	30,000	—
City of London .	1	65,000	46,000
Independent . .	1	37,000	
Equitable . . .	2	—	226,000
The New London	1	40,000	
South Metropolitan	1	—	
United General .	1	—	
Alliance . . .	1	—	
Poplar	1	—	
Commercial . .	1	—	
Ratcliff	1	15,000	
European . . .	1	—	

The supposed capital of the above-named companies (who possessed 22 works) exceeds £6,000,000; and the annual consumption of coal is more than 320,000 tons. I was lately informed by some of the superintendents of the large gas companies that gas lighting was then proceeding at such a rate that they found it almost impossible to keep pace with it. The alteration of mains and the increase of storage for gas required large outlays of capital. The Imperial Gas Company are erecting a large gasholder and tank capable of containing 500,000 cubic feet. They have now on their works one that will contain 300,000 cubic feet. The other gas companies are either erecting new gasholders or converting their old ones to the telescopic principle, giving them nearly double the capacity. This answers well on such works as are confined for room.

The author then referred to the properties of some of the gases generated in the manufacture of coal gas, and concluded as follows: In the preceding statement, an attempt has been made to arrange, as nearly as possible in the order of time, the principal facts and inventions connected with the rise and progress of the art of gas lighting. To estimate the many advantages which have resulted from its introduction would perhaps be impracticable; for, independently of the utility of its light, it has given a most important impulse to several branches of our national manufactures. The erection and adaptation of the numerous large works for its purposes have furnished employment to a large mass of our industrial population, and at the same time they have afforded many incentives to the exercise of ingenuity. But it has benefited the iron trade to an incalculable extent; and it has also occasioned a great consumption of metals of other kinds. Its operations have given rise to a large and flourishing branch of manufacture, by the demand for tubing, burners, and various other articles which that part of its processes has rendered necessary; and it may be worthy of remark that to no part of the nation has it been of more service than the town of Birmingham and its vicinity, where gas lighting was first publicly displayed. The spirit of enterprise which has marked its career reflects honour on our country. Notwithstanding that so much has been effected, the art is probably very far from that perfection which it may attain at some future period. It is fair to presume that the present meritorious endeavours widely to diffuse useful knowledge will have an appropriate influence upon that class of men who are more immediately engaged in gas operations, and enable them to add to the number of its improvements. And from the continual increase of establishments for gas lighting it seems not an improbable supposition that its use as a medium of light will ultimately be universal. It is a proud satisfaction to know that its adaptation to purposes of usefulness is entirely British; and by encircling it with freedom and encouragement, we may be able to extend its application, and by our perseverance and industry continue to set in this particular an example to all the nations of the world.

* At the time of the reading of the paper, a portion of the original apparatus was lying upon the premises; and Mr. Tadman stated that he first embarked as a gas-light man under the auspices of an oil-gas company.

A Street Lighting Experiment and an Omission.

There is no doubt great rejoicing among electricians who do not know the facts over the information published by the "Electrician" concerning a little street-lighting experiment that has been made in a road in one of the suburbs of Bath. An electrical paper announces (as though it were all on a scale of which it is proud) that "experiments" were recently made by the Bath Electricity Department to ascertain "the relative efficiency for street lighting of the present 60-candle power incandescent gas-lamps and 100-candle power Leuconium metallic filament lamps, made by the Stearn Electric Lamp Company." This is the important point—remember the metallic filaments are said to be of 100-candle power each, against 60-candle power for the incandescent gas-burners—"it was found the electric light was incomparably more brilliant, and that the area of diffusion was much wider." There is a little omission in our contemporary's notice that we should like to rectify. It is that, in place of the three 60-candle power gas-lamps taken down by the Electricity Committee, they erected five 100-candle power metallic filaments. Nor was any intimation of the experiment given to the Gas Company; so that the new metallics were compared with incandescent burners which had been in use in old-fashioned lanterns for some time in this suburban road. Our electrical friends should try to be fair by stating facts fully, and not suppressing essential ones.

A New Director of the Gaslight and Coke Company.—We learn that Mr. Joseph Lister Godlee, the Chairman of the West Ham Gas Company, has been elected to a seat on the Board of the Gaslight and Coke Company, to fill the vacancy caused by the recent death of Mr. Howard C. Ward.

Lighting of the City of London.—At the meeting of the Court of Common Council of the City Corporation last Thursday, the report of the deputation appointed to visit various cities on the Continent and inspect the lighting there, was advanced a further stage by the Streets Committee bringing up a short report on the subject, submitting the report of the deputation, and asking authority to print and circulate it for the information of the Court, without offering any opinion on it or on the suggestions it contains. The Committee's report was received *nem. con.*; and the report of the deputations, with the Grand Committee's recommendations, will be at once printed, so as to be in the hands of the members previous to it being discussed in Common Council at the next Court, on the 15th inst.

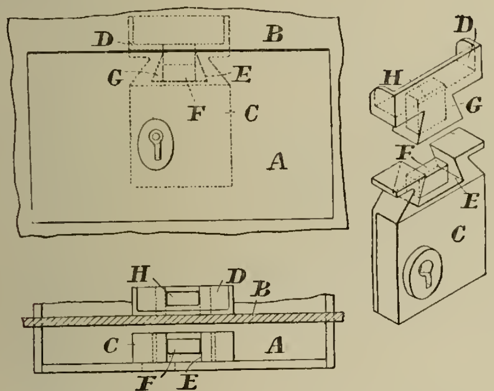
REGISTER OF PATENTS.

Coin-Meter Drawer-Locks.

Mitchell, H., of Kentish Town, N.W., and Marston, A., of Willenhall.

No. 7002; March 23, 1909.

This construction of lock is more especially intended for use on the till-drawers of coin-freed prepayment gas-meters, for the purpose of providing additional security against illicit opening of the drawer. When the drawer or door is closed, the engagement of angular or dovetail parts on the lock case and the plate prevents separation of the parts, by means of a lever; and to provide means for more effectually preventing the picking of the lock by means of a false key, the key-hole, instead of being of the usual straight shape, is made with a helical twist, and the bit of the key is made with a corresponding helical twist—an arrangement which prevents the insertion of a false key with a bit of the ordinary flat shape.



Mitchell and Marston's Coin-Meter Drawer-Lock.

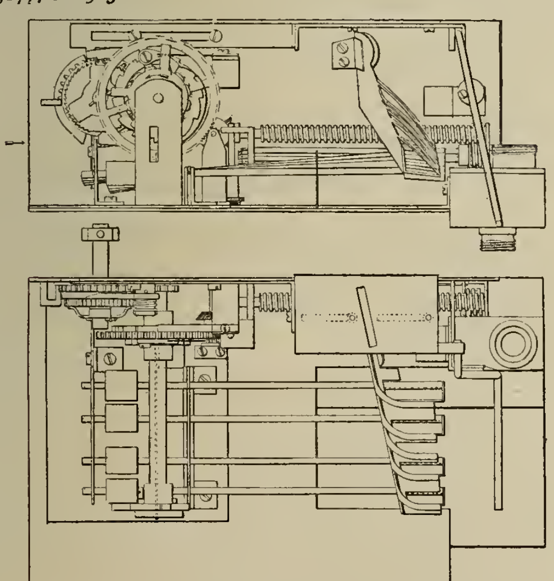
As shown, A is the till or like drawer; B, the frame in which the drawer slides; C, the lock case; and D, the locking plate. At the upper part of the case an angular or dovetail aperture or slot E is formed; and the locking plate is furnished with a corresponding angular or dovetail projection G, which enters the recess E when the drawer is shut. The locking bolt F, when the key is turned, is shot from the lock case into a recess H formed in the part G of the locking plate, and so locks the till. The engagement of the parts E and G provide effectual means for preventing the separation of the lock case from the locking plate if attempts are made to prise them apart when in engagement.

Coin-Freed Meter-Actuating Mechanism.

Hibberd, C. E., of Victoria Street, S.W.

No. 8438; April 16, 1908.

This invention relates to meters wherein a predetermined quantity of (say) gas may be obtained by the employment of a coin operating to actuate the mechanism; and it is directed to improvements in patent No. 17,877, of 1905.



Hibberd's Coin-Freed Meter-Actuating Mechanism.

The meter is provided with a screwed spindle rotated by the hand-controlled mechanism, and a worm carrying spindle rotated by the flow of the gas—both arranged horizontally within the casing fitted to the top of the meter. The spindles and worm co-act in a manner similar to that described in the earlier patent, being supported at one end in the end plate of the casing, and at the other end in a bracket secured to the front plate of the casing near the centre. The latter end of the worm-carrying spindle carries a toothed wheel which gears through an adjustable idler with a third wheel driven directly by a worm or the like on a vertical shaft operated from the usual gas-driven mechanism. The first-mentioned toothed wheel may be replaced by one of any size so as to vary the rapidity with which the gas-valve is closed, and thus change the mechanism to suit the varying price of gas. Pivoted on the end plate of the casing, adjacent to the end of the worm-carrying spindle, is a lever adapted to be operated by the worm as it approaches the end of its spindle, and thus directly operate another lever fixed to a spindle passing through the inlet valve casing. This oscillating spindle is provided with a fork projection or the like adapted to engage and reciprocate a slide-valve for controlling the gas. This valve is arranged so that just as it reaches its closed position the projection upon the oscillating spindle engages the back of the valve and forces it positively on to its seat, and ensures a tight closure. The valve may, in addition, be pressed towards its seat by a spring. A spring is also provided, tending to open the valve so as to admit gas when the worm is moved along its spindle again by the hand-operated mechanism.

The operation of the mechanism as shown may be briefly described: Assuming all parts to be in their normal position and a coin inserted, it is guided to its corresponding coin-lever and tilts this so as to set the corresponding projection in the path of the corresponding projection on the main drive-shaft, and simultaneously tilts the pivoted bar which normally prevents the rotation of the handle and releases it. The handle is now operated to give the auxiliary drive-shaft a half-turn in the forward direction; the ratchet disc thereon moving with it and being prevented from backward rotation by one of the two oppositely disposed pawls—the other pawl riding on the periphery of the smooth washer. During the initial part of this movement of the handle, the coin slot is closed; and the horizontal part of the bent lever arm dislodges the coin from the coin lever. If a coin of greatest value had been inserted, the main drive-shaft would have been allowed to make a complete revolution for the half-turn of the auxiliary drive-shaft. If, however, the main drive-shaft is stopped at any intermediate point (depending, of course, on the value of the coin inserted), the toothed disc on the auxiliary drive-shaft is stopped; but the ratchet disc is allowed to complete its half-turn by disengaging from the pin on the toothed disc. Upon completion of the half-revolution of the handle, a V-shaped projection on the slotted disc engages the pawl riding on the periphery of the washer and forces it on to the teeth of the ratchet disc, thereby preventing its further forward movement; and simultaneously the raised portion of the ratchet disc engages the point of the opposite pawl and allows it to be forced on to the periphery of the washer. The handle is then turned backwards to its original position; reversal of its movement being now prevented by the pawl engaging the ratchet disc on the auxiliary drive-shaft.

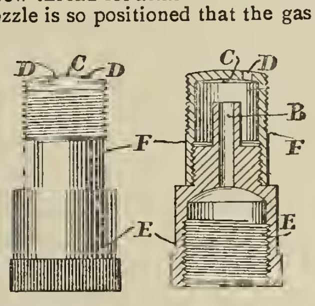
During the latter part of the movement of the handle, the coin-slot closer is removed from the slot, and the horizontal coin-ejecting arm is returned to its normal position; and, further, the oppositely disposed ratchet pawls are again reversed—one being thrown on to the periphery of the washer, and the other on to the ratchet disc. The parts are now ready for a repetition of the operation.

Atmospheric Gas-Burners.

Young, W. T., of Battersea, and Bates, C., of Bowes Park.

No. 14,658; July 10, 1908.

For use with atmospheric gas-burners for lighting or heating, this device consisting of a nozzle E for screwing to the gas-fitting; a short tube B projecting from the nozzle; and a thimble F screwed to the nozzle, and having a number of small holes D in the closed end and provided with a screw-thread for attachment of the burner. The small tube B from the nozzle is so positioned that the gas flowing through it



Young and Bates' Atmospheric Gas-Burner.

strikes the end or roof C of the thimble and rebounds before passing out of the holes D in the end of the thimble F in lines parallel to the axial line of the tube B.

The pressure of gas is in this way reduced, and a steadier and more even pressure is said to be maintained—"allowing of the better admixing with the air, thereby producing a steadier light, greatly prolonging the life of the mantles, and reducing the gas consumption at least one-third."

Inverted Gas-Lamp.

Hotton, W., of Charterhouse Buildings, E.C.

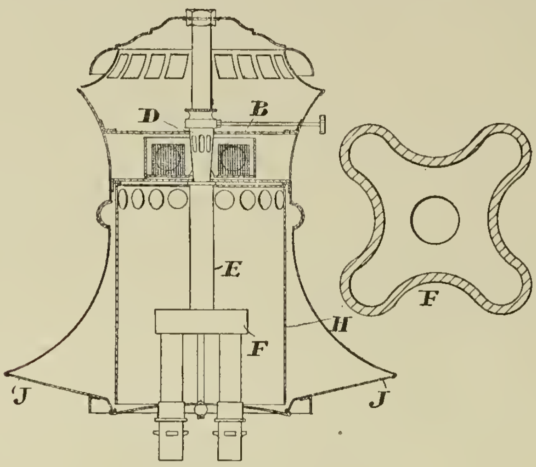
No. 14,470; July 8, 1908.

This invention has reference to incandescent gas-lamps having one or more inverted incandescent burners, each with a single conduit communicating with a mixing-chamber; the object being "to provide better means for supplying air to the burners, and also for carrying away the spent gases—thereby increasing the illuminating power of the lamp."

The illustration (p. 48) shows a lamp provided with four burners constructed according to the invention; also an enlarged inverted sectional plan of the mixing-chamber.

In the body of the lamp (near the top) a number of perforations are provided on either side, for the purpose of obtaining a supply of air

which enters the tube B fixed transversely in the interior. Fixed transversely in the centre of the tube is an injector tube D, provided with the usual regulator through which the gas is conveyed; and as air enters from either end of the tube B, it mixes with the gas at this point —the gas and air being then carried down the central tube E to the chamber F, in which both are thoroughly mixed. A screen for splitting up the air as it enters the tube B is placed around the injector tube.



Hotton's Inverted Gas-Lamp.

The mixing-chamber is provided with (four) outlets, to each of which is connected a burner. Fitting in the interior of the lamp is a cylinder H, up which the waste products from the lamp pass and escape through perforations at the top of the cylinder, so as to pass out at the head of the lamp. In order that a supply of pure air may be passed into the globe to assist in conveying the waste products up the tube H, openings J are made around the outside edge of the lamp body, and other openings around the bottom or portion of the lamp which extends into the top of the globe when fixed in position. By this means, a current of pure air is conveyed directly to the mantles.

Wall-Supports for Gas-Meters.

Dallas, G. A., of Hoxton, N.

No. 16,646; Aug. 7, 1908.

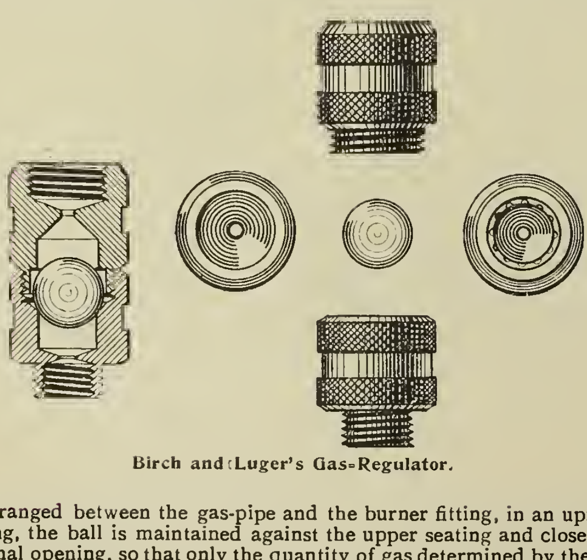
This invention comprises a portable wall-support for gas-meters, waste-water tanks, and the like—made by cutting a single piece of sheet metal and bending it at right angles at about its middle, while two parts at each side when bent overlap and are riveted together so as to give rigidity to the whole. It is on the same principle as that illustrated in the "Journal" for March 16 last, p. 776.

Gas-Regulator.

Birch, E., and Luger, R., of Stafford.

No. 16,656; Aug. 7, 1908.

In this invention a seating for a ball is arranged in a cylindrical body having a hollow screw at the bottom for connection to the fitting. The body is cupped to receive the ball, and has a central gas-passage up from the hollow screw. Above the seating for the ball an internal thread may be run to receive a cover or upper part having a connection to the burner fitting. In the upper part a second seating is preferably formed; and in both seatings a number of slight incisions are made of a size determined to pass a certain amount of gas. When the regulator



Birch and Luger's Gas-Regulator.

is arranged between the gas-pipe and the burner fitting, in an upright fitting, the ball is maintained against the upper seating and closes the normal opening, so that only the quantity of gas determined by the size of the incisions is passed. When the object is to maintain a constant pressure at the burner, a simple cover forming part of the connection to the burner is used. The desired pressure is then calculated to lift the ball from its seat the distance allowed by the cover of the device—thus forming a passage of the required size.

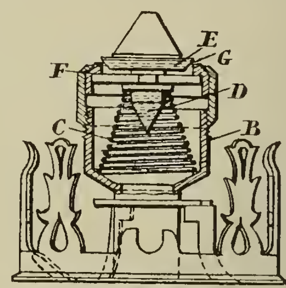
The illustration shows a section of this regulator and the various parts before they are assembled.

Atmospheric Gas-Burners.

Stephens, K., of Manor Park, Essex, and Challis, J., of Holloway, N.

No. 21,264; Oct. 8, 1908.

The patentees propose as means for controlling the supply of combustible to gas-burners for incandescence mantles to provide a helical coil or spring through the interstices of which the mixture is constrained to pass on its way to the burner, with means for enlarging or contracting the interstices. Also by supporting the mantle-carrier from the coiled spring, the latter can be utilized as an anti-vibration device for protecting the mantle.



Stephens and Challis' Atmospheric Gas-Burner.

As shown, the bunsen tube is enlarged at its upper end to form a chamber B, on the bottom of which is seated a helical spring C conical in form so as to leave substantially the same amount of space outside the coil spring as there is inside. Its upper contracted end is closed by a plug or stem D depending from the burner nozzle plate E, and having projecting arms, which are engaged by the lip of a ring or fillet F of refractory material, forming, in conjunction with the plate E, an annular jet or orifice G. The ring is secured within a cap which screws on the mouth of the chamber B, and by means of which the spring can be more or less compressed so as to vary the area of the gas-passage, and thus control the supply of combustible to the burner and also the admixture of its constituents. The nozzle plate is surmounted by a coned boss bored centrally to receive the supporting crutch for the lamp mantle.

Manufacture of Ammonium Sulphate.

Erlenbach, E., of Zabrze, Germany.

No. 27,878; Dec. 22, 1908. Date claimed under International Convention, Jan. 10, 1908.

In the manufacture of ammonium sulphate according to the process hitherto generally in use, the ammonia vapours resulting from the heating of ammoniacal liquors from gas-works, after they have been mixed with lime, are (the patentee points out) passed through sulphuric acid of suitable concentration, and the precipitated salt is removed either continuously or periodically. In order to obtain salt of high percentage in ammonia and of low percentage in free acid, it is necessary for the mother liquor to be as nearly neutral as possible; but when the percentage in acid decreases, the acid loses its capacity for absorbing ammonia, and the amount of ammonia in the vapours leaving the bath increases. In order to fix the ammonia contained in the escaping vapours, it has been attempted to wash the vapours with the sulphuric acid flowing to the bath—the sulphuric acid being brought into intimate contact with the escaping vapours in washing apparatus of various kinds; and in this way the washing acid becomes highly heated as the ammonia and the water from the escaping vapours are absorbed. In using acid of a concentration of (say) 60° Beaumé, temperatures of about 150° C. are produced, at which the strong acid has a highly destructive action on the lead of the apparatus, which is rapidly eaten away—this being generally observed in the usual method of manufacture of ammonium sulphate containing more than 25 per cent. of ammonia, and in which the escaping gases contain much ammonia.

The patentee claims to have found that it is possible to secure the perfect removal of the ammonia contained in the vapours and perfect preservation of the absorbing apparatus, and also a reduction to as low as 0·3 per cent,, or less, of the amount of free acid in the ammonium sulphate, if the whole of the water which can be evaporated by the heat of the reaction be not added to the whole of the acid required. Thus the acid is not diluted to a feeble acid, but only a part of it—sufficient for the absorption of the ammonia contained in the vapours; while the remainder (not so diluted) is added to the boiling bath of sulphuric acid of higher concentration.

As an example, he says: I will presume that sulphuric acid of 60° Beaumé is employed in the manufacture of the ammonium sulphate, and that the daily production of ammonium sulphate is 10,000 kilos. For this purpose, it would be necessary to use about 10,000 kilos. of sulphuric acid at 60° Beaumé. Of these 10,000 kilos., 8000 kilos. are allowed to flow constantly or periodically into the bath, and 2000 kilos. are diluted with 2400 kilos. of water—the acid and the water flowing together, and the mixture being taken into the absorption apparatus for the washing of the escaping vapours. The still strongly acid liquor leaving the absorption apparatus is allowed to flow into the bath; and the absorption apparatus is not attacked in any way, as the dilute acid, whose temperature can never exceed 109° C. (the boiling point of the acid of 30° Beaumé), does not act on lead. The strongly alkaline escaping vapours which enter the washing apparatus leave it perfectly neutral and free from ammonia; so that the vapours can be taken to the chimney without having, as hitherto, to be subjected to further cooling and washing. The temperature of the bath does not exceed 165° C.

The Wholesale Fittings Company, Ltd., of Commercial Street, E., have secured a contract for providing incandescent mantles, glassware, &c., in connection with the lighting of the Borough of Shoreditch during the ensuing twelve months.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Institution Gas-Heating Committee's Report.

SIR,—Mr. Kendrick's letter in your issue of June 29 (confirming some of his remarks made during the discussion following the reading of the Committee's report) calls for some comment.

Mr. Kendrick finds it difficult to believe that a gas of the composition stated in the report can have the calorific power found—142 calories net. One would think that the weight of scientific knowledge and experience attached to the names of the University representatives combined with the technical acumen of the others forming the Committee, would lead one to treat any figures they give with some caution, and after duly examining all available data. It is difficult to gauge the state of Mr. Kendrick's mind when he asks,

> "In order to clear up this point, it would be as well if they give us particulars of the method adopted, and the apparatus used in ascertaining the calorific value of the gas used in the experiments."

Turning to the report, we find most ample particulars. Under the sub-heading "Calorific Values," the apparatus and method are sufficiently mentioned; and taken in conjunction with the sub-heading—

> "Gas Rates: These being estimated by noting the time taken by a cubic foot of gas to pass through the meter; *correction being made by reducing the volume to 0°C., and 760 mm. pressure, dry.*

we have a really concise statement that would be difficult to make more complete. The conclusion of the paragraph—" the pressure of the gas at the meter was allowed for "—should convey to any technical reader a feeling that the decimal points of the calories were well looked after, and the units might take care of themselves. I would particularly draw Mr. Kendrick's attention to the words in italics.

It has been customary in England to state candle powers based upon a gas rate of 5 cubic feet measured at 60° *Fahr. and* 30 *inches pressure, wet.* Again I would call Mr. Kendrick's attention to the portion in italics, particularly the last word.

These conditions, I presume, Mr. Kendrick has applied to the measurement of calorific power as specified by the Gas Referees, who, in the "Tabular Numbers," provide a means of correcting gas volumes at differing temperatures, pressures, and humidities to their standards. Should this course have been followed by Mr. Kendrick, his figures are not on all-fours with those of the Committee.

Taking the tension due to the water, of 60° Fahr. temperature as 13·15 mm., and the expansion of gas to be directly as its absolute temperature, calculation shows that 1 cubic foot of gas measured at 60° Fahr. and 30 inches pressure wet would contain only 0·9273 cubic foot of gas measured at 0° C. and 760 mm. pressure dry.

Applying this correction to the figure of 142 calories complained of, we get 142 × 0·9273 = 131·6 calories per cubic foot, measured at 60° Fahr. and 30 inches pressure by a wet meter—a result which I hope will allay Mr. Kendrick's uneasiness and prove to him that his gas approaches (within 0·1 of a calorie) the heating effect of the Leeds production!

Should he still "hae doubts" as witness the extract:

> "—and if the members of the Committee will work out the theoretical value from the analysis given, they will find it considerably below that stated,"

I would ask him if he objects to any of the following figures.

In applying values for calorific power to the individual constituents of a gas, difficulty is at once met in considering the "hydrocarbons," the C_nH_m constituent. Analyses here indicate that the "hydrocarbon" portion of the gas supplied to the Committee contains approximately 52 per cent. of benzene vapour and 48 per cent. of ethylene. Taking Thomsen's values for the constituents throughout, viz.:

		Calories per c. ft. at 0°C. and 760 mm.
Hydrocarbons	52% C_6H_6 to 6 CO_2 + 3 H_2O (steam) at 903·2 48% C_2H_4 to 2 CO_2 + 2 H_2O (steam) at 396·4	659·9
Carbon monoxide	to CO_2	86·49
Hydrogen	to H_2O (steam)	73
Methane	to CO_2 + 2 H_2O (steam)	242·9

we get from the Committee's average analysis 142 calories net, viz.:

	Percentage of 1 c. ft.	Calories at 0°C. and 760 mm.
CO_2	—	nil
O_2	—	nil
Unsaturated hydrocarbon	3·9	25·73
CO	6·3	5·44
H_2	39·04	28·51
CH_4	33·9	82·36
N_2	—	nil
Total		142·04

Other analyses confirm the agreement between the calculated and the observed calorific powers. If there are errors in the units taken, they neutralize one another in the result.

Just why Leeds gas should be as good as Stretford gas in calorific power despite the magnitude of the "by difference" constituent, is a problem for Mr. Kendrick. One hardly likes to point out that it may be due to a similar composition of the coal gas portion; for there is an alternative reason.

If Mr. Kendrick will allow us to analyze a sample of his gas, of which he knows the calorific power by direct determination, we should be glad to provide him with the necessary bulbs for the purpose. We may then be able to decide the precise reason for his relatively low calorific power. Of course, the offer implies simultaneous publication of the details of Mr. Kendrick's determinations with those of our own.

Mr. Alex. Wilson suggested that the Committee should combine some utility with their science. Gas engineers, I feel, may equally be exhorted to combine a little science with their utility.

A. EDWARDS.

Laboratory, Corporation Gas Department, Leeds, July 3, 1909.

SIR,—We imagine we are responsible for trying to popularize the use of reflectors with gas-fires; and as some seem to question the advantageous results obtained in the recent tests in connection with the Institution of Gas Engineers' Research Committee's report, may we explain that the reflector is not level, but of such an angle that only the radiation to the hearth inside the fender is reflected, and that parallel with the floor. The radiation to the floor outside the hearth or fender is not interfered with.

WILSONS AND MATHIESONS, LTD.

Leeds, July 2, 1909.

Mr. J. H. Brown and Vertical Retorts.

SIR,—There is absolutely nothing in Mr. Brown's letter which at all controverts my statement that no guarantee for illuminating power was ever asked for either by Mr. Brown or by his Committee subsequent to the Dessau tests, inasmuch as both the correspondence and the interview to which he refers took place before the tests were completed, and moreover had no bearing upon what took place afterwards. Mr. Brown goes on to say that—

> "On our return to Nottingham [*i.e.*, after the interview which his Chairman and he had with Mr. Körting and me], we were firmly of the opinion that it was quite useless hoping to obtain from the Vertical Retort Company any guarantees with regard to illuminating power, acceptable either to the Gas Committee or myself.
>
> "After considerable correspondence, we eventually obtained a tender for the erection of an installation. The illuminating power was specified as about 14 to 15 candle power, with the 'Carpenter' burner, whereas our minimum rate is 16 candles with the No. 1 'London' burning at the 5 cubic feet rate—the standard required by the Gas Committee."

Will you allow me to say, with reference to these paragraphs, that Mr. Körting and I were pressed by Mr. Brown and his Chairman to give some guarantee as to illuminating power. But it then seemed only reasonable that consideration of this question should be deferred until the results of the tests had become known; and this was agreed to. I am, therefore, quite at a loss to account for the opinion Mr. Brown says that he and his Chairman formed on their return to Nottingham after the interview, particularly as he subsequently wrote me (May 23) as under:—

> "You will doubtless ere this have received an intimation from Dessau as to the results we obtained in our tests with English coal. We now wait to hear from you with regard to price and conditions on which you are prepared to erect an installation at our Radford works, as suggested at our interview."

On my inquiring of Mr. Brown what guarantees he would require, his answer was, "I have talked things over with my Chairman, and he agrees with me that the best course to adopt will be for you to quote us your very lowest price without guarantee." And on the 26th of June, 1908, he wrote as follows:—

> "I think that if a close price is submitted to them [meaning his Committee], they would be willing to take the responsibility themselves and erect a plant, provided you give reasonable and ordinary guarantees with regard to maintenance, life, &c., of the retorts and machinery."

In the same letter, he further suggests that the carbonizing results should be "equivalent to those obtained by our people at Dessau;" and he winds up by saying: "I feel sure that if you would submit a really favourable quotation, our people will very seriously consider the offer." Again, on the 17th of August, he writes as follows:—

> "I have just returned from an extended visit abroad with my Chairman, and we have been more impressed than ever as to the great advantages which vertical retorts offer; and I feel sure that should your Company offer anything like reasonable terms, my Committee would be very much inclined to favourably consider the same. I should therefore be much obliged if you will be good enough to let me have your quotation at the earliest possible date, embodying therewith the general conditions and guarantees set forth in your enclosure."

The enclosure referred to was a copy of the general conditions and guarantees offered by the Dessau Company in Germany. Accordingly, a tender was eventually prepared upon these lines, and sent on the 18th of September, 1908. Mr. Brown acknowledged this on the 12th of October following, stating that—

> "We have had your tender for verticals before us; and the matter is receiving very careful consideration.
>
> "As soon as we are in a position to say anything definite to you, I will at once write you, and probably call when next I am in town."

Nothing more, however, is heard from Mr. Brown until the 18th of March of this year (or five months afterwards), when he informed me that no decision had been come to as to what type of plant he intended to adopt. Finally comes a copy of his Committee's report; and this is the first and only intimation received by the Dessau Company that their tender has not been favourably entertained.

Mr. Brown ends his letter by stating that "further explanation is obviously unnecessary." From his point of view this may be so; but from the point of view of fair play, it will be seen that further explanation was very necessary.

May I say, in conclusion, that there is nothing in the correspondence, nor was there in Mr. Brown's attitude towards myself anything which led, or could lead, me to suppose that, as stated in his Committee's report, to which I have taken exception, considerable difficulty would be experienced with the Dessau system in producing gas of a sufficiently

high illuminating power to comply with the standard to which they are now working. I should very much like to know the reasons which led them to make such a statement.

CHARLES HUNT.

17, Victoria Street, S.W., July 2, 1909.

Retort-House Work—Light v. Heavy Charges.

SIR,—The benefits to be derived from charging a retort full with coal are now so prominently set forth and advocated that it sounds almost like heresy to speak in favour of light charges. Anyone bold enough must, apparently, do so with bated breath.

Experiments are constantly being carried out with elaborate arrangements having for their object the more economical carbonization of coal, and beyond all doubt are productive of beneficial results. At the same time, it must be borne in mind that, in spite of the general talk of the "melting pot," transition stages, and gyratic performances, the ordinary horizontal retort still holds its own throughout the world, and, taking everything into consideration, produces what are probably the best carbonizing results. It is with respect to horizontal retorts alone that one must be eccentric enough to take exception to the general preference for heavy charges.

I have made extensive examinations and investigations with both light and heavy charges; and so far as I have been able to determine, the light charge produces the best results from a gas manufacturer's point of view. With heavy charges, it is possible to obtain superior results in the way of bye-products; but as the manufacture of gas, not of residuals, is supposed to be the primary object of a gas-works, I think it desirable to take the gas consideration as of first importance. Whether or not six-hour charges may be wisely accepted as an article of the faith, is perhaps questionable; but that such is a most convenient arrangement for the practical working of a retort-house there can be no doubt. When working conditions, and not merely laboratory results, have to be considered, this is of great importance.

The filling up of the retort with coal does not commend itself to me; and I am strongly of opinion that further investigations into the subject by others will result in the same opinion. Practical tests should be made with the same retorts and the same coal, with both forms of charging, over a sufficiently long period in order to ascertain the comparative value. Do not let it be generally recognized or taught to the younger generation that heavy charges are necessarily the correct thing for gas making—at all events, so far as the ordinary horizontal retort is concerned.

EDWARD A. HARMAN.

Huddersfield, June 29, 1909.

Checking Waste of Water by Meter.

We learn from "Engineering Record" that the effect of meters in checking waste of water is being indicated in the cities in the neighbourhood of Boston which are supplied by the Water and Sewerage Board. Under the Water-Meter Act of 1907, a certain number of meters must be installed annually by each city and town. In Somerville, the introduction of these appliances is proceeding more rapidly than the law requires; and about 37 per cent. of all the services in the city are now equipped with them. One feature of the work in this place, which is mentioned in the last report of Mr. Frank E. Merrill, a Water Commissioner, is particularly instructive. The work of installation is proceeding, so far as practicable, on the plan of a systematic metering of all buildings within a specified district at one time. Last year, for example, 132 meters were installed in a restricted district, and, as a result, it has been noticed that the water income from this area has fallen off. In other words, the metered consumers are now paying less for the water than they did on the old "flat-rate" basis, and the individual accounts kept in the water office show a very large saving over the old rates in many instances. This fact, our contemporary remarks, should go a long way towards convincing persons who have hitherto been careful in the use of water and in the maintenance of their plumbing that the introduction of a meter system will probably mean a material increase in their water bills. The practice at Somerville is to furnish all meters without expense to the property owners, and to retain ownership of them. The owner is required to pay the expense of their installation and all charges due to freezing or other damage. It is confidently expected that a result of the experience with the meter system in the district round Boston will be highly favourable to it after a few years of trial. It is perfectly true that by a careful system of inspection it is possible to reduce the waste of water temporarily in any given district, and such a system of inspection is far better than the policy of allowing things to run along in any way under "flat-rates" until the supply of water proves inadequate to the maximum demands. On the other hand, it is questionable, to say the least, if any system of inspection has the moral effect of the presence of a meter on the service of every consumer, for up to now no method of "beating" the meter records has been devised.

Increased Storage at the Ashburton Gas-Works.—A special meeting of the Ashburton Urban District Council was held last week to receive a report from the Gas Committee respecting a proposed addition to the gas-works. The Committee recommended that a gasholder with a capacity of 25,000 cubic feet should be erected, and that the offer of a site by the Hon. R. Dawson should be accepted. The report was adopted; and the Clerk was instructed to make the usual application to the Local Government Board for a loan to carry out the work.

Gas-Workers' Union and a Minimum Wage.—At a general meeting of the Midland District of the National Union of Gas Workers and General Labourers, held for the purpose of discussing the question of a six days' week and a minimum wage, the following resolutions were unanimously carried: (1) That no six days a week system can be of any service to the gas workers unless the rest day is universally Sunday; and the meeting pledges itself to fight against any floating shift being introduced by the retorts working seven days. (2) That the minimum rate of wages should be not less than 6d. per hour, but paid without reservation or disqualification to any adult worker employed.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Blackwood Gas Bill, Derwent Valley Water Board Bill, Gaslight and Coke Company Bill, Glamorgan Water Board Bill, Oldham Corporation Bill, Watford Urban District Council Bill.

Bills read the first time and referred to the Examiners: Gas Provisional Order Bill, Local Government Provisional Orders (Gas) Bill.

Scotch Bills read the first time, deemed to have been read a second time, and reported: Musselburgh Gas Order Confirmation Bill, St. Andrews Water Order Confirmation Bill.

Bill read a second time: Derwent Valley Water Board Bill.

Bills read a second time, and committed: Aldershot Gas and Water Bill, Ammanford Gas Bill, Blackwood Gas Bill, Gaslight and Coke Company Bill, Llanelly Water Bill, Oldham Corporation Bill, Pontypridd Water Bill, Watford Urban District Council Bill, West Gloucestershire Water Bill.

Bill reported, with amendments: Harrogate Gas Bill.

Bills read the third time, and passed: Musselburgh Gas Order Confirmation Bill, York Town and Blackwater Gas (Electric Lighting, &c.) Bill.

Petitions have been presented against the following Bills: Gaslight and Coke Company Bill, by the London County Council and the West Ham Corporation; Llanelly Water Bill, by the Llanelly Rural District Council; Oldham Corporation Bill, by the Rochdale Corporation; Pontypridd Water Bill, by the Neath Rural District Council; and Watford Urban District Council Bill, by the Watford Gas and Coke Company, and consumers of water in Watford supplied by the Colne Valley Water Company.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills reported, with amendments: Gas Orders Confirmation Bill (No. 2), Frimley and Farnborough District Water Bill [Lords], Gas Provisional Order Bill, Local Government Provisional Orders (Gas) Bill, South Staffordshire Water Bill [Lords], Wakefield Corporation Bill [Lords].

Bills read the third time and passed: Bungay Water Bill [Lords], Cardiff Corporation Bill, Derwent Valley Water Board Bill, Donington Water Bill [Lords], Gas Provisional Order Bill, Local Government Provisional Orders (Gas) Bill, Pontypool Gas and Water Bill [Lords], Watford Urban District Council Bill.

The Alliance and Dublin Consumers' Gas Bill, which has passed the House of Lords, will be considered to-day by a Select Committee of the House of Commons presided over by Sir Luke White; the other members being Mr. Stanier, Mr. Horniman, and Mr. Nolan.

UNOPPOSED PROVISIONAL ORDER BILLS.

The Unopposed Bills Committee of the House of Commons (Mr. CALDWELL presiding) had before them last Thursday a number of Bills to confirm Provisional Orders granted to gas undertakings for various purposes.

Birkenhead Corporation Gas.

This was an Order granted by the Local Government Board to the Birkenhead Corporation authorizing them to acquire additional lands for the purpose of extending the gas-works, and also to dispose of portions of the land they at present own and do not require for these purposes. The land proposed to be acquired is 12,214 square yards in extent; and the Order provides that the moneys derived from the sale of lands not required shall be devoted to the paying off of moneys borrowed by the Corporation for their gas undertaking. Mr. Herbert Boyce, of the Local Government Board, explained the provisions of the Order. At the local inquiry there was one party still in opposition; but he was now satisfied, and was in agreement with the Corporation. The Bill was formally passed and ordered for third reading.

A Confirmation Bill contained Orders relating to Brough and Elloughton (Yorks.), Sutton and Hooton (Cheshire), Settle (Yorks.), Langley Mill and Heanor (Derbyshire), and Long Eaton (Derbyshire).

Brough and Elloughton Gas.

This was a Provisional Order authorizing the Brough, Elloughton, and District Gas Company, Limited, to raise additional capital, and for other purposes. The amount of capital so authorized is £3000, bringing the total authorized capital of the Company up to £9000, with the usual borrowing powers.

Mr. BONNOR MAURICE, Parliamentary Agent, explained that the price fixed for gas (5s. 3d. per 1000 cubic feet) seemed rather high, but it was a small undertaking. The present standard price was 5s. 8d.; but this was nothing like the current price.

Sutton and Hooton Gas.

The Provisional Order in this case empowers the Sutton and Hooton (Cheshire) Gas Company, Limited, to construct further works for the manufacture and storage of gas, to extend their limits of supply, and raise additional capital. The extended limits of supply include the townships of Eastham and Overpool, within the rural district of Wirral (Cheshire). The amount of new capital authorized is £24,000 (subject

to the auction clauses), and the borrowing powers are regulated by a clause which prevents the borrowing of money on the old capital of the Company. For the purposes of extension, the Company are acquiring a piece of land in the township of Little Sutton.

Settle Gas.

This Company seek power to raise further capital to the extent of £4000, and to acquire 2418 square yards of additional land adjoining their existing works and adjacent to the River Ribble, in the West Riding of York. A Provisional Order for the purposes has been granted by the Board of Trade.

Langley Mill and Heanor Gas Company.

The Provisional Order in this case extends the limits of supply of the Langley and Heanor Gas Company, Limited, and empowers the Company to acquire additional lands for the storage of gas and residual products, and to raise additional capital. The limits of supply are extended to include parts of the township of Codnor-cum-Luscoe, in the urban district of Heanor, Derbyshire; parts of the township of Smalley, in the parish of Denby; the townships of Horsley and Kilbourn, in the rural district of Belper; the township of Stanley, and the parish of West Hallam in the rural district of Shardlow. The amount of additional capital is fixed at £15,000. The land to be acquired is at Cross Hill, Codnor, and in the parishes of Smalley and Morley. Clauses are inserted for the protection of the Midland Railway Company, the Derbyshire County Council, and the Great Northern Railway Company.

Long Eaton Gas.

The Order granted to the Long Eaton Gas Company provides for the transfer to the Company of the undertaking authorized by the Sandiacre Gas Order, 1905, authorizes the extension of the limits of the Company's supply, and the raising of £45,000 additional capital. The limits of supply are extended to include the parishes of Dale Abbey, Sandiacre, and Stanton-by-Dale, all in the rural district of Shardlow (Derbyshire), and part of the parish of Hopwell. Clauses are also inserted in the Order for the protection of the Derbyshire County Council, the Midland Railway Company, the Great Northern Railway Company, and the Derby Canal Company. Additional land is to be acquired in the urban district of Long Eaton, in the parish of Stapleton, Notts., and of Sandiacre, Derby.

All the above Orders were confirmed, and the Bill ordered for third reading.

Another Confirmation Bill contained Orders relating to Bideford (Devon), Bude (Cornwall), Comber (Co. Down), Compstall (Chester), and Hayfield (Derby).

Bideford Gas.

Explaining the Provisional Order authorizing the Bideford Gas Company, Limited, to construct additional gas-works and to raise additional capital,

Mr. Bonnor Maurice, Parliamentary Agent, said the Company had from time to time carried forward various sums which now amounted to £7000. The Board of Trade had suggested that £1200 of this should go to create a special purpose fund. This still left a large amount to be disposed of; but the Board of Trade had given the Company six years in which to do so. Had they ordered the sum to be disbursed forthwith, the result would have been that for a year or so the public would have paid little or nothing for gas. So they allowed six years in which the balance is to be wiped off in lowering the price of gas. The amount of new capital is £10,000.

Bude Gas.

With reference to this Order,

Mr. Bonnor Maurice said the Bude Gas Company obtained a Private Act two years ago; but they had not completed their works. They found that the original capital was not sufficient, and they therefore wanted power to raise a further £3000. The Order provided that this might be treated as original capital, and not subject to the auction clauses.

Mr. Moon (the Speaker's Counsel) said it was inconvenient that it should go into the Order as "additional" capital not subject to the auction clauses, without explanation, as it might be regarded as a precedent. It would have been better had it been treated as "further" capital. It need not be altered in this instance, but should be in any future cases.

Mr. Bonnor Maurice explained that the circumstances were so unusual in this case.

Comber Gas.

This was an Order authorizing an increase of capital of £1000, bringing the total to £3400, and the acquisition of additional lands and works.

Mr. Bonnor Maurice explained that the price fixed (5s. 9d. per 1000 cubic feet) was rather high, but they were a small Company and were subject to competition from electric light. They were, however, not likely to charge more than they were compelled to. They were in this position, that there were a number of mill-owners who were their best customers, and if these mills introduced electricity, they would, of course, lose their best consumers.

The Chairman thought with the price at 5s. 9d. they probably would lose them. He wondered if they would sell any gas at all at such a figure.

Counsel for the Board of Trade said it had been reported to them that in certain circumstances they could not possibly sell at 5s.

Mr. Moon: And I suppose people would sooner have it at 5s. 9d. than not at all?

Counsel: That is so.

Compstall Gas.

When this Order came before the Committee, considerable discussion ensued on one of the clauses. The Order provides for the construction of additional works and for the raising of £4000 of additional capital (bringing the total up to £10,000), and for supplying gas within the parish of Ludworth, Derbyshire. The clause to which objection was taken provided that, in addition to the 10 per cent. dividends that might be paid in any year, any surplus of profits remaining might be devoted to the making up to this amount of dividends that in any other year had fallen below 10 per cent.

After some argument, it was decided to adjourn the matter for the purpose of considering precedents, if any; and although the previous Orders had been passed, the whole Bill was formally adjourned until this week.

At a previous sitting of the Committee (Mr. Alfred Emmott presiding), a Bill to confirm a Provisional Order granted by the Local Government Board to the Accrington and District Gas and Water Board, authorizing them to acquire certain lands adjoining the gas-works at Great Harwood for purposes of their gas undertaking, was under consideration. The lands proposed to be taken comprise 13,121 square yards, situate within the township of Great Harwood, adjoining the existing works of the Board and lands occupied by the Great Harwood District Council. Only formal evidence was given, and the Bill was passed along for third reading.

LISBURN URBAN DISTRICT COUNCIL BILL.

This Bill came last Tuesday before the section of the Local Legislation Committee of the House of Commons presided over by Sir F. Layland-Barratt. Its object is to enable the Urban District Council to supply gas, and for this purpose to acquire the undertaking of the Gas Company, and make further provision with regard to the water supply. The Bill was unopposed. Mr. Vesey Knox, K.C., for the promoters, said Lisburn was the centre of the Irish linen trade, with a population of 12,000. In 1893 the water and markets undertakings were acquired from Sir Richard Wallace, and £46,000 spent upon them in extension and development. The markets were reproductive, there being a balance of revenue over expenditure; and the water undertaking would be also if a water-rate were imposed. At present the water was paid for by measure, which merely covered the cost. Now that the Council proposed to extend their supply outside the town, they asked for power to levy a rate. The principal purpose of the Bill was to acquire the gas-works by arbitration, for which the Engineer estimated £20,000 would be wanted. The existing charge was 3s. 4d. per 1000 cubic feet. The other object was to obtain additional powers in relation to the water undertaking. The financial clauses were of the ordinary character. The promoters proposed to use the sinking fund, instead of borrowing, and to fix the equated period. Mr. H. A. Barbour, the Chairman of the District Council, said they considered it desirable to acquire the gas undertaking and to modernize the plant. He believed this would result in a lower price being charged for gas, to the benefit of the town and the immediate neighbourhood. The clauses were then gone through and adjusted; and the Bill, as amended, was ordered to be reported.

WAKEFIELD CORPORATION BILL.

This Bill, the main purpose of which is to confer further powers upon the Wakefield Corporation in regard to their water and electricity undertakings, recently came before the Unopposed Bills Committee of the House of Commons. Mr. Sharpe (Messrs. Sharpe, Pritchard, and Co.) explained that the principal objects of the Bill were to extend the time for the construction of additional water-works and to obtain further borrowing powers for the completion of these works. At the present rate of increase in the population in Wakefield and the district, the whole of the water to be impounded in the new reservoirs would be required in fifteen years. The further borrowing powers were asked for because it was found necessary to carry the embankments and works to a greater depth; and the works had been larger than the original estimates contemplated. The first estimate, made in 1880, was £60,000; but the Corporation had had to expend £149,000—leaving an excess of £89,000. Of the works to be authorized, the total cost was approximately £150,000; and the period the Corporation were asking for repayment was 60 years. After some discussion, the Committee decided to allow the period of 60 years to stand in the Bill. Evidence having been given by the Town Clerk (Mr. Greenhalgh), the Bill was passed, and ordered to be reported to the House for third reading.

GLAMORGAN WATER BOARD BILL.

House of Commons—Tuesday, June 29.

On the Order for the third reading to-day of the Glamorgan Water Board Bill,

Mr. Keir Hardie moved the rejection of the Bill. He asked that Aberdare should not be compelled to come within the scope of the Water Board created by the Bill without its own consent, or, if that were not conceded, that at least the financial position of the Council should be so safeguarded that no financial loss would ensue.

Mr. J. Parker formally seconded the proposition.

Sir Luke White explained that the Bill was introduced in pursuance of an Act passed three years ago, giving the County Council of Glamorgan power to make inquiries and to promote a Bill of this kind. It occupied the attention of a Committee for three or four weeks, and they came unanimously to the conclusion that the measure was necessary in the interests of the districts within the area of the proposed Water Board. It would be disastrous for Glamorgan if, on the question brought forward in regard to Aberdare, the county should lose the benefits which the Bill would provide. The Committee thought it would be necessary within a short time that districts outside the area of the proposed Board should be brought within; but they did not think it right that, as was proposed by the promoters in clause 5, the

Board should have power to apply to the Local Government Board for a Provisional Order to attain that end. In the opinion of the Committee, it would be better to confine to the County Council and the Local Authorities of districts outside the Board's area of supply the power to make such an application. He did not think that, under the provisions of the clause, Aberdare could be compelled, against its wish, to form part of the Board constituted by the Bill; and he hoped that, in the interests of all concerned, the honourable member would withdraw his amendment to reject the Bill.

Mr. Burns joined in the appeal, and pointed out that, if the amendment were carried, the effect would be to destroy a Bill the promotion of which had cost the district nearly £20,000. All the facts which had been brought forward by the honourable member for Merthyr (Mr. Keir Hardie) were fully revealed to the Committee, who gave them a fair and adequate hearing. On the broad facts, Aberdare had a superabundance of water, and practically had command of the watershed to which other communities had right of access. Glamorgan and the other communities had the right to come to Parliament to prevent one local authority monopolizing what Nature intended for all. Aberdare had not a particularly strong case for preferential treatment, and, in fact, made a profit out of water supplied to meet the requirements of the surrounding area, while lower down the valley there were communities in want of water. The claims of Aberdare could be considered at a local inquiry which the Local Government Board would hold preparatory to the granting of any Provisional Order. He therefore appealed to the honourable member to withdraw his amendment.

The amendment was by leave withdrawn, and the Bill was read the third time.

GRAVESEND AND MILTON WATER ORDER.

Local Authorities' Consent Dispensed with.

In accordance with section 4 of the Gas and Water Works Facilities Act, 1870, the Board of Trade have reported to the House of Commons their reasons for dispensing with the consent of the Gravesend Corporation and the Northfleet Urban District Council in the case of the Gravesend and Milton Water Provisional Order.

The application for the Order was made by the Gravesend and Milton Water-Works Company, who sought power to construct additional works and raise further capital not exceeding £51,000 by shares or stock, with borrowing powers not exceeding one-third of this amount. The promoters having failed to obtain the consent of the two authorities concerned, and various objections having also been lodged, a local inquiry was held on behalf of the Board of Trade. It appeared that the Gravesend Corporation did not offer any objection to the construction of the proposed works or the increased expenditure; but the Northfleet Urban District Council, who contended that the new works would not enable the promoters to supply the high ground in the southern part of their district, were opposed to the granting of the Order. Having regard, however, to the circumstances of the locality, it appeared to the Board that the works proposed would be adequate for the supply of the district for years to come. They accordingly decided to dispense with the consents of the two authorities, and allow the Order to proceed.

The remaining opposition was chiefly directed to obtaining a reduction of the existing authorized charges for the supply of water, and the insertion of a provision requiring the promoters to soften the water supplied by them. It appeared that the water was similar to that supplied in the neighbourhood by the Metropolitan Water Board and by other water companies; and the Board thought it unnecessary at the present time to insist upon the promoters incurring the heavy expenditure which would be involved in the adoption of a process for softening the water. As to the authorized charges, the Board decided to insert provisions in the Order altering the basis of charge from rack-rental to rateable value, and making such alterations in the scale as would result in some reduction in the case of the smaller houses.

Liquidation of the British Cerofirm Company, Limited.—A statutory meeting of creditors was recently held at the offices of the Liquidator (Mr. M. H. Moody) for the purpose of receiving a report upon the affairs of the Company, and deciding upon what future course should be adopted. The Liquidator stated that his investigations showed that the books had not been posted since the commencement of the Company's operations; but this work had now been carried out as far as the information available permitted. The statement issued by the Official Receiver gave among the assets the sum of £1070 as representing book debts; but the Committee's investigations revealed under this head a sum of about £2150 as owing. The plant and machinery at the works at Bromley were offered for sale by the Sheriff of Kent; but less than £250 was realized for the portion sold. One of the Directors had, it was alleged, sold the whole of the machinery to Mr. Morgan Brown (a gentleman who had been connected with the undertaking from the commencement) for £350, and had sublet the Company's premises to the same person. According to the minutes of a Board meeting held in November, 1908, the stock-in-trade, freehold premises, &c., were stated to be valued at £6408; and as the price of the freehold premises (£1500) was included in this sum, it followed that the stock, plant, &c., were worth £5000. Nevertheless, the Sheriff's sale seemed to have realized only £250; Mr. Morgan Brown paying £350 for the residue. This and some other matters required probing to the bottom. After discussion, a resolution was unanimously passed whereby the creditors present or represented agreed to the Liquidator pressing his claims against the various persons apparently liable to the Company for sundry amounts; the creditors agreeing to indemnify the Liquidator against any expenses he might incur to the extent of 5 per cent. on their respective claims. In answer to a creditor, the Liquidator said he did not think there was much prospect of the Company being resuscitated, though it was a fact that the Official Receiver had granted a licence to a gentleman to work the patents and make use of the secret process which was an important feature of the business.

LEGAL INTELLIGENCE.

ASSESSMENT OF THE PETERBOROUGH GAS-WORKS.

Company's Appeal Dismissed.

At the Peterborough Quarter Sessions last Thursday—Mr. E. P. Monckton, the Recorder of Northampton, presiding—decision was given in the appeal by the Peterborough Gas Company against the assessment of their property in the parish of Peterborough Within. The earlier proceedings were reported in the "Journal" for May 25 (p. 533) and June 1 (p. 591).

The Chairman said the Court had been through three very trying days. The hearing of the appeal had taken a very long time—too long, he thought; for the evidence might have been condensed very considerably. The Justices were unanimous in their decision, and it was in favour of the respondents. The appeal would be dismissed with costs. They found that the rateable value—in the first instance £4500, and afterwards reduced by the Assessment Committee to £4360—was a fair one. The Gas Company's valuation of £2685 was, they thought, ridiculous. They had gone through the case very carefully, had had several conferences, and this was their decision.

Mr. Morres Nickalls (for the Company) asked if the Justices would state as a fact what the finding was as to the terms in regard to lamp-posts.

The Chairman said if they were forced into giving their findings they would have to base their decisions on matters of fact and not on matters of law. It had been a very long case, and he considered the ends of the Court were met by the decision given. The question asked was a point which should have been raised at the time they were arguing the matter, and doubtless the Justices would have consented to give their finding on that particular point.

Mr. Nickalls said he was instructed to ask for the Court's decision on the point. Whether they proceeded with it was another matter.

The Chairman: I do not see that we are called upon to do it.

Mr. Nickalls: Did you find against us on that point?

The Chairman: I do not think we are called upon to state a case.

Mr. Nickalls: It is a point which has never been decided before, and it is a very important one.

The Chairman: The request should have been made when the point was raised during the hearing of the case.

Mr. Nickalls: I understood that it was raised, and that a finding on it would be given to-day.

The Chairman: The matter was not put before us in that form. If you wished to argue a point of law, it should have been done at the time; and that is when you or Mr. Ryde should have done it. I do not think we are called upon to listen to it now.

Mr. H. L. Ward (for the Assessment Committee) concurred.

The Chairman (to Mr. Nickalls): You will have to *mandamus* us if you want it.

EMBEZZLEMENT CHARGE AGAINST A GAS MANAGER.

Prosecution at Margate.

At the Margate Police Court last Thursday, Mr. Frank A. Winstanley, Engineer and Manager to the Isle of Thanet Gas Company, was charged on a warrant with embezzling, between June 19 and 26, a postal order value 7s. 6d., belonging to his employers.

Mr. Gill Davies appeared for the defence.

Without any preliminary opening of the case, the following evidence was adduced.

Mr. *Thomas C. Fuller*, Secretary to the Company, said: I know the prisoner very well as the Manager and Engineer of the works department of the Isle of Thanet Gas Company, and know that he had been in their employ just upon four years. His salary is £360 per annum. Letters delivered by the postman at the Company's offices are put in the box at the main door of the works, leading into the offices from Addington Street. The letter-box is kept locked; and there are to it three keys. One is kept by Mr. Hobbs, coke and rental clerk; another, which I never use, is in my own charge; and the third is held by Mr. Winstanley. When the box is opened in the morning by Hobbs, all letters are sorted. Those which are for the Secretary are sent to my office in the board-room; those which refer to the other departments are sent there; and those for the works department go across to the prisoner's office. That is the general routine.

Cross-examined by Mr. Davies: Mr. Winstanley was supplied with a key of the letter-box; and as a result he was entitled to open the box at any time.

Mr. Davies: It was never explained to him that he must not open the box in the evening?

Witness: Certainly not.

As Manager of the works, it would be no unusual thing for him to open the box in order to see what correspondence had arrived at the works?—Quite so.

If, in what he considered to be the performance of his duties, he opened correspondence in the evening, or on Sundays, you would not think it improper?—No.

Chief-Constable *Appleyard* said: On June 17 last, I received a communication from the Directors of the Isle of Thanet Gas Company, in consequence of which I sent a letter through the post addressed to the Company, Addington Street, Margate, on June 19. The letter contained a fictitious account, made out on one of the account forms of the Company, and purported to be sent by Mrs. Neve, No. 17, Hengist Avenue, dated June 3, and made out for 10 cwt. of coarse asphalt, 7s. 6d. I also enclosed a postal order for 7s. 6d., issued from, and obtained at, the Upper Approach Road branch post office on June 19. It was numbered 12H 059814; and I had it made payable at the

General Post Office, Margate. The name was left blank. I produce the counterfoil; and I may add that I saw the letter posted. On the Wednesday following, June 23, the Postmaster at Margate produced to me the self-same order for 7s. 6d.

Cross-examined by Mr. DAVIES: I am unable to tell the Bench any relations that may have existed or do exist between Mr. Winstanley and the Company.

Constance Jennie Morgan, barmaid, employed at the Nayland Rock Hotel, Margate, said: I know the prisoner as an occasional customer at the hotel. Between June 16 and 22, I remember receiving from Mr. Winstanley, over the bar, a postal order for 7s. 6d., which I changed for him. That was the first and only postal order I had ever taken of him. I paid the postal order in question in with my takings the next morning.

Cross-examined: It was customary to exchange postal orders for customers she knew.

R. K. Kemp, overseer at the Margate General Post Office, produced postal order 12H 059814, which had been paid into the general office by the London and County Bank.

The CHIEF-CONSTABLE, at this stage of the proceedings, intimated that he was unable to carry the case further that day. It was incomplete as it was; and he asked that there should be a remand.

Mr. DAVIES said, having regard to the extremely painful position in which his client was placed, and out of consideration, not for the man himself, but his wife, to whom the suspense would be most trying, and reserving at the moment anything he might have to say on behalf of the accused, he did ask the Bench to hear and complete the case that day, so as to put defendant on his trial and finish with it. It was scarcely necessary for him to point out how acutely accused must feel his position, and that his appearance before the Bench that morning was an extremely painful ordeal, the disgrace of which must be a very heavy punishment in itself. He was willing to assist the prosecution as far as he could, either as to the admissibility of the evidence they could not obtain that day, or in any way possible; and he did urge that, under all the circumstances, the accused should be put upon his trial that day.

The CHIEF-CONSTABLE said he desired a remand because the case was not complete. He must call other evidence in this case, which was not then available; and, besides, there were three other charges to be preferred.

The CHAIRMAN (Mr. F. J. Bobby) announced that the prisoner would be remanded till next Friday.

Mr. DAVIES applied for bail.

The CHAIRMAN: Bail will be granted, prisoner himself in £100 and two sureties of £100 each.

Mr. DAVIES: Cannot the bail possibly be reduced to two sureties of £50 each?

The CHAIRMAN: The Bench decline to alter their decision.

ADAPTABILITY OF LAND FOR A RESERVOIR.

Questioning an Arbitrator's Award.

In the King's Bench Division of the High Court of Justice last Thursday, Mr. Justice A. T. Lawrence had before him a special case stated by Mr. C. R. Fenwick, of Leeds, who was Arbitrator in a dispute between the Penrith Urban District Council and Mr. Brownrigg Pattinson as to the value of certain land required by the Council for the construction of a reservoir. The case raised the question whether the Arbitrator was entitled to award compensation in respect of what was known as the special adaptability of the land for the purpose intended; and the point was whether compensation could be given for such special adaptability when there was only one person in the market, and that person was the Council, who had compulsory powers. The facts as stated by Mr. Sanderson, K.C., who, with Mr. Compston, appeared for the Council, were as follows: Mr. Pattinson claimed in respect of 13½ acres of land near the Hayeswater Lake, and also put in a claim for an easement; but nothing arose upon the latter point. The Council obtained compulsory powers under an Act of 1907 to acquire the land, and an arbitration took place, resulting in the Arbitrator awarding £1822 if he took into consideration the special adaptability, and £312 if there was none—the land having agricultural value only. The land was required for heightening the lake, which was about 32 acres in extent, with a watershed of about 727 acres. It had a capacity of a million gallons daily; but 300,000 gallons had to go down a stream. The lake was suitable for a reservoir, being surrounded by hills except on the side near Penrith. It was moorland, and worthless except for reservoir purposes. There being only one purchaser, the Court could not give the larger amount. Counsel said the finding of the Arbitrator was as follows: "I find that the 12·58 acres of land belonging to the claimant comprised and described in the notice to treat with him in connection with the land of other adjoining owners have a special value by reason of their special adaptability and suitability for converting Hayeswater (a natural lake) into a storage reservoir of largely-increased capacity; and that such special value at the date of the passing of the Special Act existed for other possible purchasers, I have based my award accordingly." The Arbitrator then said that if the Court should be of the opinion that the claimant was entitled to compensation on the basis of his finding, he awarded him £1822; but if the Court should decide that the claimant was not entitled to compensation on that basis, he awarded him the sum of £312. His Lordship pointed out that the Arbitrator had not stated a case but arrived at a conclusion. Mr. Sanderson said they were bound to come to the Court; and he asked that the case might be put back. His Lordship said he could not do that. Mr. M'Coll, K.C., who, with Mr. Mansfield, represented Mr. Pattinson, said this was a rule to set aside an award, and not to argue the case. After further argument, his Lordship, without calling upon Mr. M'Coll, found that Mr. Pattinson was entitled to £1822 and costs. He held that the award was correct as it stood in the larger amount; and he said he could not do otherwise than take it as it stood. The position was unarguable.

AN ACTION AS TO LIABILITY FOR A GAS EXPLOSION.

Unsuccessful Claim against the Alliance and Dublin Consumers' Gas Company.

At the beginning of November, 1907, a serious gas explosion took place on the premises of Messrs. Forrest and Sons, drapers, of Grafton Street, Dublin (as recorded in the "JOURNAL" at the time—p. 509), by which damage estimated to amount to thousands of pounds was done, and serious injury was caused to a domestic servant. In due course, Messrs. Forrest and Sons took action against the Alliance and Dublin Consumers' Gas Company, with the object of making them liable for the results of the explosion; and last month the case came before Mr. Justice Andrews and a Special Jury in the Irish Probate Court. We were then able to announce the finding of the Jury, that the explosion was not caused by any negligence on the part of the Gas Company's servants, and that a verdict was entered for the defendants. Since then, however, we have been favoured by Mr. Francis T. Cotton, the Secretary and Manager of the Gas Company, with a transcript of the Judge's summing up, in which the full facts of the case are set forth; and in view of the importance of the case to gas companies generally, it has been thought well to reproduce this almost *in extenso*. The following questions were left to the Jury, who answered them all in the negative. (1) Was Joseph Williams, while he was disconnecting the cooking-stoves and the gas-pipes and shutting off at the meter the supply of gas to those stoves, doing that work with the defendants' authority as their servant? (2) Was there negligence on his part in the performance of that work? (3) If so, was the explosion of gas caused by such negligence on his part?

Mr. JUSTICE ANDREWS (addressing the Jury) said: Gentlemen, as you are aware, the nature of this action is that Messrs. Forrest and Sons, the plaintiffs, seek to recover against the Alliance and Dublin Consumers' Gas Company damages for the serious results of the explosion of gas which took place on the plaintiffs' premises on the 2nd of November, 1907; and the ground upon which they claim to make the Gas Company responsible for the injury sustained through the explosion is that there was negligence on the part of the Company, or upon the part of their servants for whom they were responsible, by reason of which the explosion which caused the injury occurred. Now you see that raises the first question which has been very much discussed in this case; and it is one of three questions which you will have to determine, because I think to avoid the risk of any reinvestigation of this before a Jury it will be desirable to ask you to answer each of the questions which I put to you even though some of them be afterwards found to be unnecessary.

Accordingly, the first question which lies at the very foundation of the defendants' liability is: Was the negligence which is alleged to have existed negligence upon the part of a person who was at the time acting as the servant of the defendants, the Gas Company? If he was, and if there was negligence, the plaintiffs would be entitled to sustain their case. If he was not, of course there would be an end of it. I would call your attention somewhat more particularly to these matters afterwards; but it may be convenient to give you a general view of what the course of the consideration will be before I go into more detail.

The next question I will ask you to consider and determine, irrespective of any opinion you form upon the first question in respect of which it is contended that, although Joseph Williams, who is the man who is alleged to have been negligent on the occasion in question was no doubt at the time a servant of the Gas Company, it is contended by the defendants that he was not, on the work in respect of which negligence is alleged to have been committed by him, acting as their servant (as such) but acting at the instance of a person whom they did not authorize in any shape or form to do the work that this man did. And on the other hand it is contended that you ought to regard him under the circumstances when doing this particular work as having been acting on behalf of the defendants, the Gas Company, as their servant, and therefore being in the position of making them responsible for the negligence in the doing of the work if negligence it is.

Now the next question will be one of the most important questions in the case, and one which has been elaborated at great length by Counsel on both sides, and ably discussed on both sides. Was, in point of fact, Williams in doing the particular work in question, guilty of negligence? The particular work you have quite accurately before your minds. It was the disconnection of some gas-cooking stoves from the gas-pipes, and the shutting off of the meter which supplied the gas that was to be used by the stoves. Now what negligence consists of it is right to bear in mind; and the legal view taken of negligence differs from the common-sense view taken both in respect of the aspect and the manner of the negligence used. It must always be estimated by a Jury in regard to the particular circumstances of the particular case whether a certain action is negligent or not. It is negligent to abstain from doing in particular circumstances that which a reasonably careful man would under the circumstances in the judgment of the Jury do—take reasonable precautions for the purpose of preventing any accident or damage. Or it would be negligent if there is the omission to do, in the discharge of any particular duty or the execution of any particular work, something which in the judgment of the Jury a reasonably cautious and prudent man would do in the particular circumstances. And if these particular circumstances are circumstances which in the judgment of the Jury imposed upon the person who is doing the work the obligation of taking much care, he should take much care; and that is why I put to you that in estimating whether or not there is negligence you must not consider it as an abstract question, but apply your minds to it as it refers to a particular work and particular circumstances which existed at the time, as existing circumstances under which the work has been done.

Now it has been stated as absolutely incontrovertible that the escape

of gas is a dangerous thing, and anything which is done to prevent an escape of gas ought to be done with due care, so as to secure that the danger shall not subsist. Now although there may be, in the judgment of the Jury, negligence upon the part of the person who is doing a particular work for which we must assume for this purpose that his employers would be responsible, it may be that still his employers may not be responsible for the consequences of that negligence. Because if they themselves—through any person for whose acts they were accountable, and by whose acts they would be responsible—did directly contribute to the injury which is complained of by negligence upon his part, then they were in the condition of being as it were both directly to blame in connection with the work which was being done and had been done. The law is that defendants should not be held responsible, even if there was what you may consider an absence of due precaution on their part that, if it stood alone and independent of other circumstances, would constitute negligence in a matter of this kind.

Now that being the general aspect of the case, I will have to refer you as briefly as I can to the way the evidence stands—invite your attention to what appears to me the most material portions, and leave to you only that which is material to study for yourselves. We come to consider what is the position of the parties. At the time that preceded the occurrence upon Nov. 2, 1907 (the date of the explosion), there had been entered into between the Messrs. Forrest and Sons, the plaintiffs, and the Gas Company the defendants, three contracts which we may regard as one. Among other matters which Messrs. Forrests were getting done to their premises in Grafton Street and to a certain extent round at the back in Wicklow Street, there were a considerable number of improvements and renovations in progress. We have it that Mr. Ashley, as architect, was discharging an architect's duty in respect of, I believe, such of the gas-fittings as had been contracted for by the Gas Company under the contracts. Now three stoves were to be erected, and they were to be supplied from a meter which was to be a hired meter and from which it was necessary to have a connecting pipe. The hiring agreement did not provide for what was to occur at the termination of the hiring. With reference to these cookers, they would remain (notwithstanding the hiring agreement) the property of the Gas Company. The user of them would be what Messrs. Forrests would be entitled to; the property in them would remain in the Gas Company. But if the occasion arose either before or after the expiration of the actual period of time according to the agreements in this case of replacing these stoves, the result then would be that there would be upon the premises of Messrs. Forrests these gas-cookers which would not belong to them, but which would belong to the Gas Company. The Gas Company in that state of things would be entitled to remove them; and in that state of things Messrs. Forrests would be entitled perhaps to remove them, if they regarded their premises as encumbered by these gas-stoves, the hiring of which had ceased and which they did not wish to retain. But if Messrs. Forrests did (as they do not appear to have done in any shape or form) claim the right to remove or give instructions that certain work should be done for the purpose of removal, the other aspect of the case would be: Were the Gas Company entitled to call upon Messrs. Forrests to remove the stoves? Now Messrs. Forrests no doubt might have been entitled to call upon the Gas Company to take the stoves away. But if so, the persons whom they would have called upon to take them away would have been persons authorized by the Gas Company to receive their intimation or request; and it would not have been a legitimate mode of requiring the Gas Company to take them away by making a communication of that kind to a person who was not in authority at the Gas Office—a mere gas-fitter. He would be the person who was to do the work for the Gas Company—not the person who was to enter into contracts for or on behalf of the Gas Company, or to originate work which could be originated if they were properly applied to for the purpose.

The reasonableness of this will be apparent at once if you see a different position of things. If a request of the kind were made to a simple fitter, as Williams was upon the occasion, he would have no opportunity then of supplying himself with all that was necessary for the purpose of giving effect to that which he was called upon to do with perfect safety—because the request was that the thing should be done at once, and after his experiencing some hesitation and it having been insisted upon by Mr. Thackaberry acting on behalf of Messrs. Forrests, he proceeded, and he said he proceeded to do it under circumstances which were unfavourable. If the Gas Company had been required either by their responsible officer or others in any more formal way to do the work they would have had an opportunity of giving such directions as they thought fit to their authorized workmen, the authorized officials, to take care that it was done in the way in which it ought to be done, and to provide them with all requisites that might be necessary to give effect to that which they would be bound to give effect to—the proper and reasonable precautions being exercised which it would be right should be exercised for the purpose of preventing the execution of the work from running the risk of being incomplete.

Now I have ruled that there was no contract between Messrs. Forrests and the Gas Company for the removal of the cookers which would have caused the Gas Company to be responsible persons for the purpose of giving effect to the work. I have ruled that no such contract was comprised in, or implied from, the hiring agreement that has been put in evidence; and I also ruled that there was no evidence to sustain the existence of any such contract as a contract outside and independent of the agreement. But the reason that I refer to the other matters is that that does not exhaust the case; and it is for this purpose that I call your attention to the fact that under particular circumstances—namely, the cookers remaining the property of the Gas Company—there would be the right on the part of Messrs. Forrests to call on them to be removed, and on the part of the Gas Company to call upon them to be removed.

The matters which preceded this 2nd of November I need not weary you by going over again—a general reference is sufficient. A great deal of the renovation and improvement work was going on, including a very considerable amount of gas-fitting work; and in that state of things a communication took place upon the 1st of November which I call your attention to, in Thackaberry's evidence and the evidence of Redmond and Williams. There is other evidence in the case which I will be obliged to call your attention to; but it would rather appear to me that the most important evidence of the case is to be found in the testimony of these three—Thackaberry, Redmond, and Williams. I do not think it necessary nor do I intend to deal with them with anything like minuteness although it was necessary we should have a great deal of evidence, for the purpose of giving the whole history of the case, and showing you for instance what the different departments were, how the basement was circumstanced, how it was that it was lighted not by gas but by electricity, what was the condition of the doors, and all these matters which were so clearly explained by them in the matter.

I may pass on to refer to the evidence of the very intelligent gentleman who spoke of the accuracy of the maps and explained the basement, the position in which the meters were, the communicating pipes between the meters and the gas-stoves, and the position in which the gas-stoves were, and who pointed out the various doors and portions of passages, shops, and otherwise. He indicated very clearly and very satisfactorily the geography of the premises. Mr. Murray having given his evidence, the next evidence that was given in the case was the evidence of Mr. Thackaberry, which I must refer to. It does not appear from the evidence that there had been any antecedent communication between Messrs. Forrests and the Gas Company with reference to the removal of these cookers. The intimation that was given to remove them does not appear to have been given before. But what is material to bear in mind on this part of the case is that the first communication that they were to be removed seems to have come from Mr. Thackaberry on the 1st of November. Understand on that date among the improvements and changes which were taking place in Messrs. Forrests' premises were certain improvements in connection with the inside part of the establishment, and the place in which these cookers were and had been used practically from the middle of the preceding January. That had been called throughout the evidence the old kitchen and the old place; and there was another place referred to as the new kitchen. This new kitchen was designed by the architect; and under the contract in respect of which the work was carried out, it was carried out so that what could be otherwise done by gas might be done as we all understand by the ordinary kitchen range. Towards the end of October, as Mr. Thackaberry seems to have thought, Messrs. Forrests elected to cease using the gas cookers, and resorted to the use of the new kitchen range which was practically complete. Different persons who were acting on behalf of the defendants (and among them Williams) were doing the different gas-fitting work which had not then been completed; and it was gas-fitting work that Williams came on the premises upon that particular occasion to do. It is not shown, as I mentioned before, that the particular work which the Gas Company had the persons there for doing, in any shape or form included the removal of the cookers in question.

There is a slight discrepancy between the evidence of Mr. Thackaberry and the evidence of Williams. Mr. Thackaberry gave to the best of his opinion the hour at which the explosion occurred. What he says did occur was this (and it becomes important to consider it), that on the morning in question he spoke to Williams, and told him to disconnect the gas cookers, as the kitchen range was going to be used. This was between the hours of 11 and 12 o'clock of the 1st of November—a Friday; and he believes that between 3 and 4 o'clock the same day he went to the kitchen in which the cookers were, and found there Mr. Sugg and Williams. Mr. Sugg pointed out to him that the cookers had been disconnected, and he noticed the large cookers disconnected. They were moved out from the wall, having been close to the wall before. He noticed that the small cooker had been removed, and he said that after the conversation took place which has been referred to on both sides—as to whether they were going to have other gas cookers in the other place—he indicated that it was in contemplation but not absolutely decided upon. He was cross-examined by Mr. Campbell, first, upon the question as to whether when he saw the disconnection did he give any instruction or direction with reference to it. Mr. Campbell referred to the night watchman, Redmond, who had charge of the place; and he said he did not recollect giving him instructions or directions on the subject, and went on to state that Mr. Ashley was directed in connection with the works, but that it did not include the operation of removing the cookers in question. Now he said further that he had never seen the specification for the work the Gas Company were to do—that the architects attended to this themselves; and he then told us that the night porter had as part of his duty to turn the gas out, not only in the place where the meters were, but as Redmond afterwards told us where there were other taps to supply gas in the building. He also said, for the matter of the firm's defence, that sufficient precaution had been taken.

So we have from each party what precaution had been used. He said further on that he had no recollection that Sugg or Williams suggested to him a warning afterwards. The next witness, Mary Murphy, told about the night before the explosion. She was the kitchen maid and was it seems the person to get up in the morning to look after the arrangements of the kitchen—light the fires and so on. She told where she slept and the position in which the housekeeper's room was below hers; and she said that she had nothing to do with the turning off or on of the gas—that as far as her department was concerned everything in her portion of the premises in which she was concerned appeared to be in good order and nothing astray. She then stated that on the 1st of November she had used pretty nearly for the last time the cookers which upon that occasion had not been disconnected; and the very last use would appear to have been when certain cooking was done and finished at the hour of about 2 o'clock. After that the disconnection would appear to have taken place. She then gave her account with regard to what occurred—about having proceeded to smell the gas and having gone to her superior, the housekeeper, with reference to it; how she and the housekeeper carefully went through the premises and looked at the gas-caps; and that they were all turned on. After she had communicated with Redmond, she said she proceeded downstairs, having the light of the lantern. She went into the kitchen where the range was; left the lantern, and proceeded through the kitchen where the cookers had been; and then she described (as a part of what had been done) the making a change from one kitchen to the other. When, after having been all through the coal hole and the passages, she came near and opened the door of the new kitchen where

the cookers were, she described the outrush of gas as the explosion took place. Some of you seemed to think, perhaps, it was an extraordinary thing, her description that it took her off her feet; and when the gas having escaped in that way would only go through the door she had opened, get into the other kitchen where the light of the lantern was, where the fire was lighted, and in the way she described that that is how the explosion actually took place.

Now I come to Mrs. Stewart, the housekeeper. She described what the kitchen maid had done; what she knew of the gas on the morning in question, and how it occurred to her that there were some of the taps open in the passages; how she got up and examined them with the greatest activity, and seemed to have her suspicions aroused to see them open. She said Redmond's duty was to attend to the lights in the passages as well as to the other duties in connection with the meters and matters of that kind; and she said that it was also his duty to attend to the gas-meters. After she went her round of inspection on the night of Nov. 1 (and nothing had attracted her attention), Redmond would have gone after her. She said she remembered the last cookers going out of use. Before the explosion, on the 1st of November, she said she saw a man at the cookers—that man was Williams. She had seen him; and she knew he was one of the Gas Company's men. He was with some of the men at the other gas-fitting work that had been referred to. She said she examined all the different places on the night of the 2nd, and then closed and secured the doors and left them all right; and it was not suggested for a moment that Williams was not there and at the time was in the employ of the Gas Company. But it is a different thing if he was actually doing it either for or at the instance of Mr. Thackaberry under circumstances which would not, according to the view of the Gas Company, make them responsible.

The next witness is a witness whose evidence I must ask you to thoroughly consider, because he is a very important witness in the case, Thomas Redmond himself. Now after describing that he had been for six years acting in the capacity of porter at Messrs. Forrests' premises, in which he lived, he tells us that at night his first duty was that about 11 o'clock he went round about the Grafton Street side of the premises, turned off all the gas jets that were along the walls on the different floors (third, fourth, and fifth floors) towards the front of the house; and he states that then his duty was to go down to the basement. On this night had arrived at about a quarter past 11; and the first person apparently he met was the housekeeper. He then went down to the basement, which has a certain amount of electric light; and his evidence is that he "knocked off" the three electric meters and then turned off the three gas-meters. On the Friday night he turned off the three meters in the basement as usual and locked the door. It then appears that he went to the top of the Wicklow Street side of the premises, and left the keys with Mr. Simpson, who is the custodian of them after Redmond, who had charge of them, delivered them up to him. You see that is practically his description of everything he did. He repeats he turned off the electric light first. But after stating that that was the first thing he did, he goes on to say that the next electric lights are in the area. He says that he had a candle alight, not a lamp. He then goes on to say that after he turned off the electric meters he went to the gas-meters. Williams had told him that he was working at the cookers and about to disconnect. Now he says at this part of his evidence that that was all the information he had. I do not think there is the least necessity to impute to a witness who uses at one time language not the language exactly he uses at another that he has perjured himself. It is a slight test—a matter which should not be concluded unless there is more satisfactory proof of it. But the witness may not be regarded as a deliberately untruthful witness if he gives sometimes an imperfect account, sometimes a contradictory account at one part of his evidence than at another. It is necessary, without imputing perjury, to decide in every case, and not the least in a case of this kind, upon the extent to which you should rely upon the accuracy of the testimony given. And on this point he says that was all the instruction he had. Now he goes on to say that when the gas was on the cooker the handle was hanging straight down, and apparently that would be the normal state of things and everybody seems to say that would be so. It is a curious thing if this man, though there for six years and entrusted with the duty of turning off the gas throughout the place, would have any doubt (our attention was called to it irrespective of the position of the handle) whether the gas was off or on. He says with this cooker, when the gas was on, the handle hung straight down. He then says (and this is in reference to the particular occasion in question) he shut it off. He indicated upon the model what he did.

The case for the plaintiffs is that, in point of fact, he was turning on the gas, and I think that there is no doubt that that was the immediate cause of the gas escaping and going away up through a number of apertures. He understood that the disconnection had taken place, though they say not; and that this man Redmond should be blamed for it because they say that he was not doing what was his natural duty—turning the thing off, but instead he was turning it on. By reason of what they say was the fault of Williams he was turning it on, and they call attention to that which has been considered in the rest of the case that he did not even neglect to warn him on the occasion in question of the exceptional stiffness in the turning of the plug, which Williams says was tightened-up, and which the other witness corroborated was so tightened-up on the occasion of the accident. But what he does say is that Williams had been working on the cookers, and it was time to disconnect them. But it does not appear that he did. He himself swears later on with reference to the mode in which he acted when he was performing this operation of turning off the gas. He says it was he who always pulled the handle towards him; and he says that the practice was that the handle remained on the stock. The second thing he acts upon is that there it was hanging, and that the way it hung down indicated to him that the gas was on and that he turned it up when it indicated that the gas was off. He went on to say that the handle was stiff—sufficiently stiff to remain there. He says there was no previous escape or mistake; and he said that when he was turning the handle on it clicked against the pipe, and (as far as he could see from the dark place when they made the experiments) that would be in the nature of pulling the handle towards him. This part of the case is accepted on both sides, that he did something that turned on the gas. He said that on the Friday night no more force was required to close the tap than upon any previous night; and he said afterwards, in connection with the doors, that a person could not have gone in there and interfered with the premises—he having locked the passage doors after inspecting them in discharge of what no doubt was his duty.

He then says further on towards the close of his evidence: On Friday Williams said to him of all the jobs he ever was in this was the worst; that he was told on Thursday to do nothing although he was putting the fittings in the ladies' sitting room, and then that he was called away on Friday to disconnect the cookers and that he said "I believe that Mr. Thackaberry and Mr. Sugg were in the cooker kitchen." Now he goes on to say that between three and four o'clock Williams mentioned to him something like that the meter was off or the connection was cut off, and it was nothing more. What had he said before? It was that all the information he got was that something had occurred which, as he reported in his evidence, was one of two things—either that the meter was off or that the connection was cut off, and that he could see both were. Now he was very stiffly cross-examined with reference to his evidence; and the portion of it which bears upon this matter I will now refer to. After he said that he could not exactly say what it was that Williams said to him, he repeats that what he said was either that the meter was off or that he had cut the supply off the meter. "He said something to me about the meter;" and then he was asked with reference to what else could have been said, and he was asked about the labels. Now in Mr. Thackaberry's evidence early in the case he indicated that the cookers had labels on them. He is asked about the labels; and he says "I can't remember seeing the labels, but think the labels were there." That is the expression. He says that after the explosion all the meters had labels on them. "I only noticed them there, and then I could not say that they were there before the explosion," and the word brass was used. He said that this brought to his recollection what apparently had not been present to his mind when he was stating this other evidence, because when the word brass was mentioned he stated "I saw the brass labels on the meters. I remember now that there were brass labels on before the explosion." The labels were there to show for what purpose each meter was used—one for domestic supply, one for the stoves, one for the cookers; and he did not remember this till hearing about the brass on the handle. "The meter has brass on the handle. What Williams told me was about the cooker meters. When I turned on the meter, I remembered what Williams had told me. I had forgotten what he told me." And then he was asked what was the truth about that. He said, "The truth is I had forgotten what he told me;" and then he said immediately after that "He told me he had done something to the meters." He was cross-questioned upon it. "What could he have told you except that he had turned them off?" And then his answer was "He told me that the meter was off or that the connection was cut off. He may have told me that the meter was turned off." He then stated further, "I could not really understand whether he said the meter was off or the connections were cut off; it went out of my head; it did not come down to me that particular." Then Doherty and Williams, who were afterwards witnesses in the case, were directed to stand up, and he was asked to look at the men and was asked whether Williams in Doherty's presence had told him he had turned off the meter and disconnected the meter; and he then said "I could not swear, I won't swear he did not." And he then said again, "He told me he had been working at the cooker, and was about to disconnect it." Towards the very close of the cross-examination he was asked again what he did when he turned the cooker meter off. "When I turned the cooker meter that night it was not stiffer than at any other time; there was not the slightest difference; it was just as usual." "If Williams turned the meter off" the question was; and then he immediately said "But I am sure I turned it off;" and then he said "If it was off my action would have turned it on."

And this is consistent with the case presented on behalf of the plaintiffs, that however the explosion occurred it was on account of the action of Redmond, which, however, is insufficient to enable you to determine whether he was responsible, because he was thrown off his guard by something Williams had done. Then there was an answer that was much commented upon. "If I remembered what Williams had told me, I believe I would have done what I did." Then he gave some account of that apparently strange answer. The way he explained it was that work was going on, and the men who were dealing with the gas might for temporary purposes have turned it either on or off, so that it would—notwithstanding what Williams had done—have been a possible thing to have turned it on, and therefore it was a natural thing for him to turn it off on the occasion in question. He then said: "When I turned it off I was under the impression that Williams had turned it on again;" and he then said he knew there was a nick-line across the plug of the cock; that he had seen it. "But," he added, "I don't know what it was for. I did not notice any particular direction of it at any time. I always went as far as the lever and until it stopped." And then he went through the process which was gone through so often, and indicated to you the actual way in which he did it. He said then: "The key was not tight on," and whether he really was thinking of what he said before, that it was stiff on the nut or not, I don't know, but then he said "The plug was tight but not the key." Then he said that one was stiffer than the other two—that is, that the cock of this particular cooker-meter was stiffer than the cock of the other two meters. He said a moment afterwards, "The key was not tight on; it was loose." That seems somewhat at variance with what he said before; and he said a little further on, "It was always stiff to turn, but not a bit more so that night than on any other occasion." And then the remark was made semi-jocularly and semi-seriously—a kind of question that was put to the effect "Are you telling the truth?" and the curious answer was that he did not know. But I think what he really meant was that he was not sure whether the evidence he was giving was correct or not. You heard him and I only ask your consideration of his evidence.

On re-examination, he says there was only one conversation with Williams on the subject. There were other questions put with a view to suggest that it was possible with regard to the time that the conversation took place that sufficient time had elapsed to make it reasonable for him to forget.

I cannot pass on without referring to some portion of the evidence of the next witness. He was an independent witness and has been

referred to by both sides, and his evidence has been contrasted with the evidence of Rush and other witnesses. Martin Lambert, of the Fire Brigade, went there on the Saturday morning, Nov. 2, and appears to have been almost one of the earliest persons among the witnesses who were examined who arrived there after the explosion and after the girl who described the explosion. She was up at half-past six, and spoke of the explosion and fixed the time; and Mrs. Stewart spoke of it also at the same time. He says that having got the call, he was there at five minutes past seven in the morning. It occupied from the time he got the call at the Fire Station something about a couple of minutes. He then describes the way in which he came up in front of the premises, and the condition in which he found it—a good deal of wreckage and broken glass. He thereupon went below with two men and he said that Rush, who was in the Gas Company's employ, was one of them. He said he did not to his knowledge see anybody connected with Messrs. Forrests. The object of his going down was to examine the meters. He did not take a light down until he felt by experience there was no danger of any further escape of gas or explosion; but having, as I gather, felt his way or groped his way to the meters, he ultimately got there. When he found there was sufficient light to enable him to get there, and there was no danger of anything like an explosion, a match was lighted by Rush, and then he said he examined the meter. The first meter he met with was turned off—that was the stove meter, supplying the stoves other than the cooking stoves. The next meter was the far one—that was the domestic supply meter which was utilized for supplying gas for lighting the house. It also was off. "I examined the centre one, then—the cooking meter—and found it turned on. All were connected with the street main. There was no disconnection of the pipe at the meter. Rush called my attention to the meter being on. He turned it off with the handle that was on it. I could not say what position the handle was in before he turned it off; but I saw him turn it. I did not notice whether there was any difficulty in turning it. I saw him turn it. He turned it in the ordinary way to the best of my knowledge. He simply said that it was off. I left the meter-room after that." He left the premises about half-past nine. A little later he returned, and found that some other things had been done—namely, that the three meters had been quite disconnected from the main pipe, and absolute security effected.

His cross-examination largely repeated what he had said before—that he could not say in what position the key was; and in re-examination he remarked: "There was nothing exceptional in the way I turned it off; if there had been any difficulty about it, I would have observed it. I was standing close by, the three of us came up together." And then to wind up, "I cannot say whether he exercised much force or little. If he says he used much force, I would not contradict him. Rush made no remark." That has been commented upon inasmuch as it was said by Rush that he did make a remark which might reach the ears of Mr. Lambert, whose truthfulness is beyond question. The remark was "stiff;" and Mr. Lambert says he did not hear that.

I need not trouble you with the evidence of Robert Sharp, the Secretary of the Company, who explained the charge he had of the different doors, and the extent to which he was able to control them with the master-key, which was with a view to satisfy you that such precautions were taken that other persons could not have got in and interfered with the meters in question. Thus the only persons whose acts we have to consider are the persons who were before you as witnesses in the case. Another witness, the housemaid, had the key. She says she saw Williams between half-past three and four in his workshop, and she saw Mr. Sugg behind him in the workshop.

Another witness is Mr. M'Garvey, a member of the Institution of Mechanical Engineers. He did not come on the scene until Nov. 5. He then visited the Messrs. Forrests' premises and examined the different places—the gas-cooking room, the meter-room, and the fittings in the basement; and he said that then when he went to the gas-cookers he found that there were two, one a double one and one a single one. He said that at that time they were drawn out somewhat from the wall, and the single one did not seem to be drawn out quite so far as the other. He spoke of the different gas escapes, but the disconnection work resulted in there being three places of considerable size at which, if the meter was turned on, the gas from the pipe would escape. The apertures appeared to be in the disconnection of one of the pipes of the small meter and in two of the pipes which supplied the grills. Now the whole of this detail shows that what had been done resulted in there being left there three apertures practically in the supply pipe through which, if the gas was turned on, it would be allowed to escape. He said the disconnections were such that if the gas was on at the meter it would escape at these three points. He says the gas-cooker meter had its supply from the main, and was capped and stopped off on the 5th of November—one of the matters they suggest ought to have been done at the time Williams was at work upon it. He says the plug on the stop-cock was screwed harder, a thing which it was suggested Williams had not done, at all events to the extent to which it has been contended it ought to have been done; and then he says he tested the stop-cock with the key and was not able to move it. It was tightened up, and it has been suggested that this could have been done so that no amount of force could open it. But if you did so, you would be doing something which would be beyond what was reasonable.

Now some questions were put as to what suitable precautions would be, or what dangerous neglect would be. It will occur to you as common sense that what a man is bound to take is all due and reasonable precautions having regard to the circumstances of the case. You may be able to suggest that he should have done something or done something else, and it would have been more perfect. Absolute perfection is one thing; due and reasonable precaution is another. And it does not necessarily follow that because you can point out something that would have been more effective than what has been done, that therefore what has been done was not a reasonable and sufficient precaution in itself. But evidence has been given by persons who are supposed to be competent to give their opinion; and this is the evidence of Mr. M'Garvey: "Would it be a reasonable precaution to screw up tightly the stop-cock in a case where three apertures existed in the supply pipe, that were controlled only by the stop-cock?" He said: "It would be a precaution, but it would not in my opinion be absolute security." The way in which the question was put does not include a reference to one of the important circumstances in the case—that the man who had charge of it had been warned to the extent of being told that it had been turned off. He then said: "In my opinion to cap-off the main would be absolutely safe." And then he says with reference to another question that was put to him, in case the man had no cap with him, what would be a reasonable precaution to take in the case where there was a lead pipe between the cock and the meter as in this case; and he says the lead pipe might be cut and hammered-up. He added that there would be no difficulty in a skilled man plugging the three apertures of the cookers at the supply pipe. Then he was asked "In your opinion, as the result of your experience, was the leaving of three open apertures controlled only by an unscrewed stop-cock a dangerous state of things;" and he said it was. But a controversy here was that it was unscrewed. He then interposed by saying he had a very large experience (extending over 45 years), including work done by the Alliance Gas Company. He then said: "On the 5th of November, I did not use force; but I found the plug screwed up. I used reasonable force; sufficient to move any well-regulated cock." And he said: "It would not move; and I am able to swear it was at that time screwed up tightly."

Now in the conclusion he said that a man who found the key upon the stopper hanging down in the way the key was said to be put upon it—that he could not move it by pulling it towards him—if it were in the condition in which it was suggested it was upon the other side. Anyway, the thing was done. It is not suggested that anybody but Redmond did it; and in some shape or form he performed some operation which (it is part of the plaintiffs' own case) had the effect of turning it on. He then said, "If the key had been, as we suggest, left hanging down, it would have been impossible for Redmond, by the movement that he made, to have turned it off." That was Mr. Henry's suggestion from the operation he performed.

As to Mr. Jones's evidence, I will not have to trouble you at any length. He was in the employ of the firm of Messrs. Curtis and Son, and is asked this question with reference to what is here being investigated: "If when the gas-cookers were being disconnected from the supply pipe in the way that the disconnections were described today, what precautions would be necessary to be taken to prevent an escape of gas at the points of disconnection?" He gave an involved answer: "Seeing that the three open connections would not be stopped-off for want of the brass cock which was retained on the smaller pipes, I consider that the fitter should have capped-off that pipe." Then he went on to say that at the meter simpler precautions could be taken by the fitter—namely, to disconnect the lead pipe connecting the stop-cock and the meter; tighten up the plug of the cock; and place an iron cap on the outlet of the pipe. And he went on to say that a variety of other things could have been done. He said he could have disconnected the lead pipe and hammered it up. He said he could have disconnected the lead pipe and gone to the meter itself, and there he could have put a cork or plug (that would be most effective) into the meter, and so checked off the possibility of gas getting through. And all these things would have been precautions which would have stopped gas from going through. But he added the plug should in all cases be tightened up and the lever lifted; and he said that this applied to every one of these precautions.

With regard to the lever, as far as Williams is concerned, it might have been going a little out of his province if he interfered with the custody of the lever. The last question was, "In your opinion as the result of your experience, would the leaving of three open apertures in the supply pipe controlled only by an unscrewed-up stop-cock be a dangerous state of things?" He said it would. The same question was then put to him, screwed up stop-cock for unscrewed-up stop-cock, and he said he still considered it would be a dangerous state of things. Then he said "a man should not, in my opinion, leave the premises with openings of that kind there during his absence."

I need not refer you to Mr. Sampson's evidence, because he was the gentleman to whom the keys were handed; and I need not trouble you much with Mr. Ashworth's evidence. In the course of his cross-examination by Mr. Ronan, the account cropped up for work done in fitting up these cockers. That was by the Richmond Gas-Stove Company; and it was paid for to the Richmond Company.

I will now recall your attention to the evidence of a very important witness, Joseph Williams, as contrasted with the evidence of Redmond. There is no doubt about his position. He was simply a fitter at the work there. He says he has been a fitter for the last twenty years, most of the time at work in Dublin; but at the time in question in the actual employ of the Gas Company and doing work for them at Messrs. Forrests. He said he went into the employ of the Gas Company in the May previous, and went to work at Forrests in July. He said that Mr. Sugg was his foreman, and was the person who would point out the work he was to do, and did so, and that he was there almost every day. He said: "The whole of the three meters were there when I went," and each (other than the cooker meter) supplied the stoves and the light, and he said that the cooker meter supplied the cooking stove. Here is what he says occurred on the 1st of November. He spoke as to the three labels having been there—three perfectly legible and distinct labels. "On the 1st of November, Friday, I was at work in Forrests doing work which Sugg had pointed out to me to do on the previous day. On that day, Friday, between half-past two and three o'clock, Mr. Thackaberry came down the basement passage calling out did anyone see the gas-fitter. I came out of the workshop where I was at the time, and met Mr. Thackaberry there. He brought me over to the door of the old kitchen and said "Do you see these cookers? I want you to shut the gas off these and disconnect them." I hesitated for a moment. He then said "Williams, these are my instructions, and I want it done at once." I said then "I will do them now, Sir." Mr. Sugg was not there at the time. He said "I went down there to the gas-meter, to the cooker meter, and shut off the gas. It was the only supply to the cookers. I turned the cock off at the meter. I pulled the key towards me, which would have left it in a horizontal position. I found it straight down before I pulled it. I left the handle looking out to me. The handle was left on the square; the plug of the cock was on the loose side. It could be turned on and off freely, but was tight enough to remain in this position even

with the key hanging on it. I next tightened the nut on the tail of the plug. The nut screws on the plug and tightens it. I tightened it on with the footprint (the trade mark of the wrench), which was a suitable instrument for the purpose; and I made it very stiff. I left the plug tight; so tight that it would require a considerable effort to move it. I did nothing else then. The handle was then up to the iron pipe which rose up in horizontal form. I had not taken off the handle nor put it hanging downwards, nor turned the handle from me. When I left the place the gas was clearly turned off and the plug tight. I came to the cookers and disconnected them. The whole job took about half-an-hour. Mr. Thackaberry was at the door when I went in, and when I was disconnecting the cookers. He remained partly in the kitchen while I was at the disconnection, and he said nothing to me, nor I anything to him; but he saw me beginning to disconnect them. Mrs. Stewart, the housekeeper, came in when Mr. Thackaberry was going out, and saw me at the work of disconnecting. When I had finished disconnecting I went off to my other work. Mrs. Stewart said that she had selected a cooker in the Exhibition. This indicated that the operations that Williams performed would be of a permanent character. Up to that time Mr. Sugg had not been there; and so far as I know he had not known of the cookers being disconnected. He came to the ladies' dressing room where I was about 4 or 4.30, when I had disconnected the cookers. I saw Mr. Thackaberry twice that day. Except on that occasion I never had orders from Mr. Thackaberry about work."

Then witness spoke about Doherty, a boy who was with him as a helper. When he saw Mr. Sugg at 4.30 he and Doherty went down to the basement, and Redmond was there. He continued: "I knew that he was the man that turned the gas off. He was standing in the workshop. Doherty was there also. I said to Redmond 'that cooker meter is shut off, and the cookers in the kitchen are disconnected.' Redmond said it was a good job. I said of all the jobs I ever was in this 'takes the biscuit,'" and then he went on to say about being cut into fifty different pieces by Mr. Thackaberry. This was not intended, it was explained, that Mr. Thackaberry was giving him orders to do work, but was hurrying him in order to get the rooms that he was in charge of. He was cross-examined at considerable length, and went over again a great deal that he had said before. He was asked in reference to the terms of his employment, and said he was paid weekly wages. It appears that he was paid by the Gas Company his wages for the week which would have included the Friday on which this operation took place; and whether you think that that would at all amount to a recognition of him as their servant will be a matter for you. The time he was at the operation was half-an-hour. If he had not reported the matter he was doing, it would seem to me (that is a matter for you) that it would not help us very much in the case—much less involve the Gas Company in responsibility for him during that period as their servant. He then said, "I took no orders from anybody except Mr. Sugg, except that one order from Mr. Thackaberry with reference to the disconnection of the cookers." He said that he had often told him to get such and such a room ready and get out of it with all the expedition he could; and it was with reference to that that he used the expression about the fifty pieces. "Except on the one occasion he never gave me an order in his life," He then repeated that on the Friday between half past two and three he gave him an order about the cookers. It was in the workshop. "It was not between 11 and 12 o'clock he gave it to me, as Mr. Thackaberry seems to think. The first time I saw Mr. Sugg after that was 4.30 o'clock. He came to the ladies' dressing room and remained there about five minutes, and then he left. I did not see him afterwards. I did not see him at all in the gas-cooking room that afternoon. It was only in the ladies' dressing room I saw him that day. He says it was downstairs; but I was not with Mr. Sugg downstairs or in the basement at all that day. He came into the ladies' dressing room, and I said to him I had disconnected the cookers in the kitchen. What cooker? said he. I said the cookers in the kitchen. I told him Mr. Thackaberry wanted to see him. It was just about when I was leaving off—about 20 minutes to 5 o'clock—that I saw Redmond. Redmond got the information that he did get about 5 o'clock that afternoon. He said I finished the disconnection of the cookers about 3 o'clock, and then he went into the workshop and Mr. Thackaberry and Mr. Sugg were there. I did not tell Redmond that Mr. Thackaberry and Mr. Sugg were in the cookery kitchen. He said that I told Redmond I had shut off the cock at the meter, and disconnected the cookers in the kitchen. I said nothing else to him. I told him first about the cookers. I went there to see Redmond, and found him there. I did not say anything to Mr. Thackaberry as to what I had done about the cookers. Redmond was the only person I mentioned it to." He then said "I never had disconnected a cooker in my life, and I knew absolutely nothing about cookers. I thought I had disconnected the whole three of them; and I thought that I had the whole of the pipes disconnected." It appears with reference to the evidence of Mr. M'Garvey that there had been some disconnection not completed with regard to one of the cookers; and he explained that by saying that when he set to work he had to use a piece of iron pipe, that he moved it a little further away in order to get at the connections in such a way that it concealed from him a pipe he had omitted to disconnect; and the materiality of that is that he did not make as expert a job as he might. He says that he was in a hurry to get the thing done, as he had another job in hand; and he says he took all the care a man could take, although he missed one of the connections. He said "Before I began disconnection, I had not seen Mrs. Stewart. I had a conversation with her while I was disconnecting. Before that I had arranged the cocks of the meter; and I had done so to prevent the gas passing." Then he said a little further on that, though Doherty was with him, there to help him if necessary, he did not require his help; but he stood by him while screwing-up the cock, and that he thought it was better to get Doherty to help him. He described how he did it. He says: "The object of the nut there is for the purpose of adjusting the plug; and I tightened it to show Redmond that it was stiff—stiffer than it had ever been. I tightened it as much as I could the way that he would know about it. I told him all about it. I tightened the cock as well as I could. I had no cap with me. I was taken unawares. I don't think it could be tightened so tight that the handle could not turn. I first turned it off, and then tightened it up. It would have required a tremendous amount of force to have turned it at the handle after I tightened it up. I did not plug the open apertures. I did all I could; and I thought I had done enough." Then he repeats that he told Redmond about it, and that part of what he told Redmond was not that he had screwed it up tight. He repeats that he told Redmond that he had cut off the gas and disconnected the cookers. He said it was possible to take the handle off; but "if I had taken away the handle the cock could not have been turned at all." Asked whether he is sure he did not turn the plug after tightening it up, he said he did not.

I need not delay you with the testimony of the helper, Charles Doherty, which corroborated his evidence. But there was a suggestion by Mr. Chambers that the similarity of the evidence in the case of Williams and the man who worked under him would go to show that they had made up their story together. Whether you think that or not is a matter for yourselves. You can judge the extent that you think the evidence was real, and whether there was any foundation for the imputation suggested that these two witnesses had gone over the story in relation to matters that did not occur at all, so that their versions might tally one with the other. Doherty does not corroborate Williams with reference to all matters that occurred in his presence, and that he told Redmond the meter was off and the cookers disconnected.

I pass on to John Rush's evidence as quickly as I can. He it is suggested is a person we should look on with some caution, because he is an employee of the Gas Company. Well, he is; and if he had any sympathies, they would probably be with the Gas Company more than with Messrs. Forrests. But that is not sufficient, unless there is something else, to justify us in disbelieving him. His evidence, in some respects not immaterial, corroborates Williams'. He tells us that he has been in the employ of the Gas Company for a considerable length of time—some 29 years; and he is in the position of a man of some consequence there—a foreman main-layer. He heard of the explosion about 7.15 on the 2nd of November—the Saturday morning after it occurred; and he says at the time he was in the Hawkins Street premises where the Gas Company appear at all events to have stores. Having heard of the explosion he went off as quickly as he could to Messrs. Forrests; and by that time the Fire Brigade had arrived. It is commented upon that two persons who might be supposed to give relative testimony have not been called as witnesses. It is legitimate for Counsel, if he thinks fit to do so, to comment on such a matter; and it is clearly legitimate for a Jury to consider what an uncalled witness might say. It is legitimate for a Jury to consider that the party who was not called would not have advanced their case. The three men who were not called were with him. He says Lambert and the other three (the four of them) went down to the meters. They examined the meters the day after the explosion. He examined the meters, and found there was no smell of gas, and he struck matches for a light. The men who were not called were Jones and Lambert. This was an early examination of the place, apparently before 7 o'clock when his men examined each of the three meters. But at a later stage, about half-past nine, the cocks were undoubtedly put into a different position. He says, "I myself examined each of the three meters. Two of the meters—that is, the one for the stoves and the one for the lights—were turned off, and the centre meter was turned on. I could not tell how the handle was. I looked at the meter, and the handle was on the cock; but I could not tell what way it pointed. I looked at the nick of the cock, and not at the handle. I pointed out to Lambert and the other man that the cock of the centre meter was on. I pointed out in the case of the other two cocks that they were off. I turned off the cock of the centre meter. The handle was on the cock; but I could not see which way it pointed. I turned it off at the handle. I did not take the handle off either before or after I turned the gas off. The plug was stiff. I had to use a good deal of force to turn it off. I noticed that at the time; and I passed the remark that it was stiff." Lambert says he did not hear that; but if one man did not hear it, and another equally credible witness swears that he said it, the balance of the testimony would rather appear to be in favour of the man who says a thing was said, as against the man who swears that he did not hear it. "We read the label on the meter that was turned on; it was to the effect 'control of the gas cookers.' I left it on. I left the handle in the position in which I found it." In connection with the stiffness, he said "I thought it was a cock that had never been used; it did not occur to me that it had been screwed up." But whether he thought on the matter, what he has undertaken to depose to is that it was stiff—sufficient to require considerable force to turn it.

Mr. Gillespie is another of the not unimportant witnesses. He is in the responsible position of the Company's inspector for the district; and he says that on the morning of the explosion he was at Messrs. Forrests. He did not arrive there until a later period—somewhere about 10 minutes or a quarter past nine. He went into the meter room and asked permission of Mr. Thackaberry for the purpose. He says it was then daylight, and he examined the meters. All the cocks were then off. Here is what he says about the centre meter, which is the cooking meter: "I examined the cock of the centre meter, and found it quite stiff." Now it is not impossible that that might have been done afterwards. There is no direct evidence about it one way or another; somebody might have done that. But as a matter of fact there is no evidence it had been actually touched. "I found it quite stiff. I found it tightened. I examined it for that purpose. I mean by tightened, tightened by screwing up." And then he took the very secure precaution of capping-out those places where the gas would have come. He was cross-examined, and his cross-examination led him to repeat a good deal of what he had said before. He said, "You cannot tighten the plug so that you cannot in any way turn it with a lever."

Next came Mr. Goodenough, who had been relied upon on the other side. They asked him what, in his opinion, would be sufficient or insufficient. He presents himself as having about 1000 fitters under him. I will go over the questions that were put to him. He is asked, "Assuming that the gas for these cookers was supplied by one meter which supplied nothing else, and that the manager of the establishment in which the meter was had himself given directions for disconnecting the gas-cookers, and that the man who had charge of the meters for the establishment knew they were disconnected, from your experience would it be a sufficient precaution to turn off the gas at the

meter and screw up the nut?" And Mr. Goodenough gave the answer: "Yes; but there is another assumption, and that is that the man having charge of the meter" (this would be Redmond) "had been told that the meter was turned off." Mr. Chambers referred very fully to some of the matters on which he contended Mr. Goodenough and another gentleman who was examined were witnesses for him. They regarded the operation as adequate on the assumption that the disconnection was for a temporary purpose, and that the fittings were about to be used again in some reasonably short time. Mr. Chambers has drawn your attention to it. His view was that if the man who took charge of the meter had been recently told of the disconnection, there would be little risk of his having forgotten it; but if a considerable time had elapsed there might. He then said at the end of his examination: "By permanent disconnection I mean that the pipes would not be used for any other purpose." Mr. Edgar, a contractor from London, with 250 men under him, is asked the same question that was put to Mr. Goodenough, and he is of the same opinion—that this would be an adequate precaution. "If my men had done such work under similar circumstances the precaution would have been sufficient. If the disconnection was permanent, capping would be adopted. I would consider the screwing-up quite as efficient as cutting the lead pipe and hammering; and if my man was aware that it was temporary, it would be waste of time and material to cut the lead pipe, and ought not to be done." And then Mr. Chambers at once asked him what would be the extent of the damage. He thought a pipe could be restored for something like half-a-sovereign; and he said the screwing-up alone would not be enough, but that it would be sufficient to warn the man that a change in the meters had occurred, and that a meter was turned off. Mr. Chambers claimed that this witness was a witness for him.

The next was Mr. Howell, who told you that the stove which was ordered was ultimately not put up; and this was presented as showing that there was an intention not to leave the fittings permanently disconnected, but that at some (not very definite) time to utilize them for another purpose. It was commented on that this was not brought to the mind of Williams at the time.

The last witness in the case gave the explanation with reference to the account in which the sum of £34 was shown to be paid for the fitting-up of the cookers, and it appeared that it was done by the Richmond Stove Company, as work that they were entitled to be paid for and not work done on behalf of the Gas Company at all.

Now I am sure you will pardon me for, after a six days' trial, having done the best I can to refer you to the material parts of the evidence that I thought it important for you to consider; and I can only add that anything I have not drawn your special attention to you are not to imagine that I have overlooked. But a vast amount of evidence must be given which when the case closes has practically worked itself out and does not bear on the important questions. Therefore the two questions I will leave you, and on which I will get your answers as a matter of fact, are: First, Was Joseph Williams while he was disconnecting the cooking-stoves and gas-pipes and shutting off at the meter the supply of gas to these stoves, doing work with the defendants' authority as their servant? It is not enough that he should be at the time in the employ of the Gas Company; you have to investigate further whether in the particular operation he was performing he was doing it with their authority or on the order of Mr. Thackaberry. Next, independently of what conclusion you would come to on that, it is best to have answers to these questions so that there should not be any longer investigation of this case: "In your opinion, from a deliberate consideration of the whole of the evidence, was there negligence on Williams's part in the performance of the work he did?" It would not be useful or desirable for me to say to you more than I have said already. It is not for a man to have performed every possible act that it could be suggested he ought to have performed. The real and substantial question is, Did he do all that was reasonable or in the judgment of the Jury necessary, or did he omit some precaution that a reasonable man ought to take. And the extent of the reasonable care ought to be estimated with regard to the work in hand, if the result is likely to be serious. And then a further and important question. If you come to the conclusion (it is entirely for you) that there was negligence on Williams's part, was it that that caused the accident? If there was negligence on his part and nothing else, and that you think the explosion was the actual result of that negligence, the question ought to be answered "Yes." But if you think there was something else in the case, and that there was some other negligence in the case for which other persons were responsible—in this case in Messrs. Forrests' employ (namely Redmond), and I think his is the only action that would be regarded as bearing on that, and that that practically contributed to the accident occurring, and was one of the efficient and effective causes of the explosion occurring, and in that sense both were taking part in what was causing the accident—then you ought not to answer the question was it occasioned by the negligence of Williams although there may have been negligence on Williams's part, because what really would have occasioned it in that event would have been the negligence of the two. You are not to investigate anything in connection with the damages that will be awarded, whether they are great or small; you are not trying that. When you have answered these questions, the parties will be in a position to deal with the rest of the case.

The Jury, after more than an hour's deliberation, handed down their findings.

Mr. Justice Andrews: With regard to the first question, Was Joseph Williams while he was disconnecting the cooking stoves and gas-pipes and shutting off at the meter the supply of gas to the stoves doing the work with defendants' authority as their servant? Answer: No. Second, Was there negligence on his part in the performance of the work? No. If so was the explosion of gas caused by such negligence on his part? No. Then, gentlemen, that is a finding for the defendants.

His Lordship gave judgment accordingly.

The Farnham Gas Company have given notice that they intend to apply for a Provisional Order conferring upon them powers to supply electricity for public and private lighting. During the past eight or nine years, four similar attempts have been made.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION

And their Concessions.

In last week's issue (p. 986), we reproduced two statements from the "Financial Times" with regard to the gas supply of Vienna and Frankfort-on-Main, in which places the Imperial Continental Gas Association possess works. Our contemporary further referred to the matter on the 29th ult. in the following terms.

A somewhat alarming telegram has just come to hand from Vienna concerning the affairs of the Imperial Continental Gas Association in that city. It is asserted that the Municipality have refused to extend the concession of the Association, which expires in 1911, for another term of 25 years; that they have also refused to purchase the Association's gas-works at the termination of the concession, preferring to build their own; and that, finally, they have refused even so much as to buy the English Company's mains. The first of these statements is correct; the second, in its bald form, is somewhat misleading; and the third is absolutely inaccurate.

The facts, according to inquiries we have made in authoritative quarters, are these. The idea of municipalizing the gas system, as well as other public service systems, having of late years found favour in Vienna, it has been practically certain for some time past that the Imperial Continental Gas Association would not have their concession renewed after 1911; and the City Council have, in fact, already taken steps to ensure the construction of their own gas-works in time to commence supply as soon as the English Company's concession lapses. This supply they will naturally give through the mains, service-pipes, street-lanterns, &c., already existing. Article 6 of the contract for the supply of the Vienna suburbs with gas, signed on April 29, 1899, by the Imperial Continental Gas Asscciation on the one part and the Municipality of Vienna on the other, runs as follows:—

It is hereby agreed that on the 31st of December, 1911, the Municipality shall purchase the mains, service-pipes, candelabra, brackets, lanterns, and gas-meters in the territory covered by the contract, so far as such mains and lighting plant are the property of the Association. The purchase of the above-mentioned objects shall be effected by the payment of a sum to be determined by means of a judicial valuation, which sum shall be due after the valuation is completed.

In the event, now seemingly determined, of a non-renewal of their concession in 1911, the Company's position is as follows: (1) Their amortization fund will have provided by that date for the complete redemption of the entire capital sunk in the undertaking. (2) They obtain in cash from the City Council the price of all the lighting plant owned outside their gas-works. (3) They have in hand for sale the large building site occupied by the gas-works, which is now situated in a popular neighbourhood, and the "unearned increment" value of which has been progressively increasing since its first acquisition by the Company as far back as 1842. (4) They retain their business hold in the Austrian Capital by various concessions from Floridsdorf and thirteen other small communes which are independent of the Viennese Municipality. They are situated on the left bank of the Danube; and the contracts with them run on till dates varying from 1919 to 1942, but mostly expiring about the year 1930. This was the state of affairs when, to tempt the City Council to postpone expropriation for another 25 years, the Association proposed to reduce the price of gas and hand over the gas-works and plant free at the end of that period. To have secured a renewal of the concession would, no doubt, have been good business; but the refusal of their offer by no means places the Company in a bad position.

The concession enjoyed by the Association for the gas supply of Frankfort-on-Main also comes up for revision at the present moment. Frankfort, however, unlike Vienna, has made no preparations to carry on the gas supply of the city on its own account; and though it would be physically possible, at great expense, for the Municipality to construct the necessary works and lay the required plant by April 1, 1911, when the concession expires, it is thought unlikely that it will do so. In Berlin, the Association have worked on friendly terms with the Municipality for something like half-a-century, sharing with them the gas service of the city and the very extensive surrounding suburbs.

OLDHAM CORPORATION GAS UNDERTAKING.

General Manager's Report on the Past Year's Working.

The General Manager of the gas undertaking of the Oldham Corporation (Mr. Arthur Andrew) has presented to the Gas Committee his report on the working for the twelve months ending the 25th of March. It furnishes the following particulars.

The expenditure on capital account during the year was as follows: Oldham station (land), £60; Higginshaw station, £5973; Hollinwood station, £5043; Gas-mains, £1011; Gas-meters and cooking-stoves (less depreciation), £2088—total, £14,175. The gross revenue was £171,619, and the gross expenditure £145,114; the balance carried to profit and loss account being £26,505. The annuities during the year amounted to £3342; the interest on loans and stock, to £13,271; and the sums payable to the respective sinking funds, to £5420—making altogether £22,033. The net profit on the year's working was consequently £4472. Adding the balance brought forward, £20,565, and one year's accrued interest from the annuity redemption fund, £548, there is a total of £25,585. Deducting the amount to which the Corporation are entitled in aid of the borough fund, £8652, the credit balance to be carried forward is £16,933.

There was a decrease last year in the amount received for all residual products; the average price obtained for coke being 11·33d. per ton less than during the year 1907-8, and 4s. 9d. per ton less in the

case of tar. Coke values were nevertheless well maintained, taking the fall in the price of coal into account. The reduction in the cost of coals, &c., used during the year of 0·254d. per 1000 cubic feet was more than counterbalanced by the fall in residual values, which was equal to 1·065d. per 1000 cubic feet. Carbonizing wages were further reduced by 0·227d. per 1000 cubic feet of gas manufactured.

There was an increase in respect of the repairs and maintenance of works amounting to £2653, due partly to the enlargement of purifiers at Hollinwood (the estimated cost value of the old set being debited to revenue), and partly to the number of retorts renewed and repaired at Higginshaw and Hollinwood having been above the average. There was an increase of £863 in the expenditure for distribution, due to an increased number of cookers having been fixed free, and to the large number of old meters which were exchanged for new ones without charge. The cost of fixing cookers free during the year amounted to £1839.

The quantity of gas supplied to the street-lamps and municipal buildings free of cost was 82,735,000 cubic feet. There were 110 additional gas-lamps erected within the borough, and 57 in the out-townships. The total number of lamps fixed in the district of supply on the 25th of March was 5745. The total number of lamps of the incandescent type at that date was 3382 within the borough and 1008 in the out-townships; being an increase of 1665 during the year. The number of lamps then fitted with flat-flame burners within the borough was 541; but all these will be changed to the incandescent type during the current year.

The quantity of gas manufactured at the different stations during the year was: Oldham, 108,050,000 cubic feet; Higginshaw, 696,182,000 cubic feet; Hollinwood, 552,469,000 cubic feet; do. (water-gas plant), 77,942,000 cubic feet—total, 1,434,643,000 cubic feet, compared with 1,471,434,000 cubic feet in the preceding year, being a decrease of 36,791,000 cubic feet, or 2·5 per cent. The following quantities of coal, oil, and benzol were used in its production: Coal, 115,789 tons 7 cwt.; gas oil, 256,996 gallons; benzol, 117,087 gallons. The average quantity of coal gas made per ton of coal carbonized was 11,717 cubic feet, compared with 11,539 cubic feet in the year 1907-8. The loss of gas from leakage, &c., was 70,017,000 cubic feet, or 4·83 per cent. of the quantity made, compared with 75,354,000 cubic feet, or 5·12 per cent., before. Many old mains were renewed during the year; and probably this has been a material factor in reducing the quantity of gas unaccounted for. The maximum quantity of gas delivered in 24 hours was 8,366,000 cubic feet, on Dec. 2, 1908, compared with 8,140,000 cubic feet the previous year; being an increase of 226,000 cubic feet. The minimum quantity delivered was 1,504,000 cubic feet on June 14, compared with 1,611,000 cubic feet before; being a decrease of 107,000 cubic feet. The average illuminating power of the gas, as tested by the No. 2 "Metropolitan" burner, was 20·13 candles.

The total number of meters fixed on the 25th of March last was 51,959, of which 1445 were of the prepayment type; 817 meters were fixed in new premises and others in which gas was not previously used; and 114 meters were permanently disconnected. The actual number of consumers on the above-named date was 46,435. The number of meters then fixed but not in use was 3097.

There was an over-expenditure on street lighting account of £2279, caused principally by 1363 lamps having been converted from flat-flame to incandescent lighting, and by the number of automatic lighting controllers having been increased from 112 to 593. The total amount expended on this account during the year, including the balance brought forward, was £5859. The amount received from the Borough rate was £3500, and the sundry receipts were £80; making a total income of £3580.

The net increase in the number of additional cooking stoves and grillers fixed during the year free of charge to consumers was 2512. The total number in use on the 25th of March was 15,016. There were 35 gas-fires, &c., sold during the year.

There was an increase of 10,007,000 cubic feet in the quantity of gas consumed by private consumers in houses and shops, and a decrease of 40,610,000 cubic feet in that consumed in mills and workshops; this being due to a dispute in the cotton-spinning industry and bad trade in the machine-works.

A comparative analysis of the expenditure per 1000 cubic feet of gas sold during the past three years is appended to the report; and this is followed by the accounts of the department, prepared by the Borough Treasurer (Mr. J. F. Lees), and certified by Mr. D. Cooper, of Oldham.

LONGTON GAS AND ELECTRICITY SUPPLY.

The Past Year's Working.

At the Meeting of the Longton Town Council last Thursday, the Gas and Electricity Committee mentioned, in the course of their minutes, that the annual statement of accounts had been presented and discussed, and it was recommended that the best thanks of the Committee be tendered to the Engineer and General Manager (Mr. W. Langford) "for the able and successful manner in which he has conducted the works, and on the satisfactory financial results obtained in each department."

In moving the adoption of the minutes, Mr. Hulse (in the absence, through illness, of Alderman Brookfield, the Chairman of the Committee) said the gas-works in all departments were in a most efficient state of repair, and all the work done during the past financial year in connection with renewals, mains, and meters, had been paid for out of revenue. Once or twice he had heard that the Longton works could not manufacture gas with results equal to those obtained in one or two of the Pottery towns; and the case was instanced of Stoke. He did not wish to say anything against Stoke; but there was a point which needed explaining. It cost Longton £3200 a year for interest and loan charges more than it did Stoke; and if Longton could retain this £3200, they would be on an equal footing with their neighbours, and at the same time be able either to reduce the rates by at least 6d. in the pound or supply gas at a very much lower price. If the facts he had referred to were considered, they would see that Longton was well able to compete with any of the Potteries towns. During the past financial year, the price of gas had been reduced by 5d. per 1000 cubic feet, and this had entailed a considerable reduction in revenue. Compared with the previous year, the receipts were £2644 less, accounted for, as explained, by the reduction in price and the loss on the sale of residuals. There was also a falling off of 3½ million cubic feet in the consumption, which was explained by the slackness of trade and the substitution of electricity for gas for street lighting. The prepayment meter system had become a paying concern; the consumption of gas having increased during the year by 2¼ million cubic feet. The current year, after meeting all obligations, was commenced with a balance of £388. The year just closed had been the most successful the Corporation had had, even allowing for the smaller revenue. The Longton Gas-Works, he might remind the Council, made more gas per ton of coal than any other gas-works in England; their return being 12,507 cubic feet. This was something to congratulate themselves upon, and another matter for gratification was the fact that the leakage and gas unaccounted for had during the last few years been reduced from 8·5 to 4 per cent., which, considering the district was one where the pipes were affected by mining operations, was most creditable. The Electricity Department had also had a successful year; meeting all renewals without adding to the capital account, and securing an increasing demand for current. The increase in production was 35·6 per cent. The Committee, who were trying to make the dual concern a highly successful undertaking, were thinking of extending the electricity generating plant by November next, at a cost of £2500, which would be paid for out of the reserve fund. In conclusion, he submitted that the Committee deserved the congratulations of the Council; and they themselves owed a debt of gratitude to the General Manager for the efficient way in which he conducted the works. When the time came to hand over the undertaking to the federated district, Longton would place in their hands a grand asset. It would be in a better state financially and in every other way than it had ever been since it had been a Corporation concern.

The minutes were passed.

BURSLEM CORPORATION GAS ACCOUNTS.

The total expenditure on revenue account of the Burslem Corporation Gas Department, for the year to Dec. 31 last, came to £21,285; while the receipts were £29,020. There was thus a balance carried to profit and loss account of £7735. The net profit for the year was £2321. The report of the Gas Engineer (Mr. Edward Jones) on the year's working states that 17,536 tons of coal were carbonized; the quantity of gas made being 211,057,000 cubic feet, or 12,036 feet per ton of coal. The unaccounted-for gas amounted to 9·3 per cent. There are 40½ miles of mains. Ordinary meters in use number 2412, and prepayment meters 4835; while there are 696 public lamps. The yield of sulphate per ton of coal was 28·03 lbs. The capital per million cubic feet of gas sold amounts to £679.

STOURBRIDGE GAS UNDERTAKING.

In his fourth annual report to the Stourbridge Urban District Council, on the working of the gas undertaking for the year to March 31 last, Mr. C. H. Webb, the Engineer and Manager, says that the sales of gas (ordinary, prepayment, and public lighting) show a small increase of 724,500 cubic feet, as compared with the previous year. This, he thinks, may be considered satisfactory, seeing that the general trade of the district has not been good. The revenue account shows an increased income from the sale of gas, and also from coke; the latter having more than balanced the reduced amounts received for the other residuals. The total increase is £210. The expenditure for the year is greater by about £16. These differences increase the balance carried to profit and loss account by about £195; the gross profit being £10,748. After deduction of annual instalments, and interest, &c., which are somewhat less, there remains as a surplus £2209 (an increase of £328), of which it has already been decided to transfer £1750 to the relief of rates. During the year there have been laid about 2 miles of mains; while there have been fixed 44 ordinary and 237 prepayment meters, and 172 cookers.

The accounts show that the gas made amounted to 212,851,000 cubic feet, of which 190,558,700 feet were sold, 2,806,500 feet used on the works, &c., and 19,485,800 feet, or 9·15 per cent., were unaccounted for. The expenditure on revenue account was £24,893; and the receipts were £35,641. The make of gas per ton of coal carbonized was 10,909 cubic feet; and the net proceeds of residuals came to 63·55 per cent. on the cost of the coal.

COVENTRY CORPORATION GAS UNDERTAKING.

Past Year's Working—Charge for Gas.

When the year's working of the Coventry Corporation gas undertaking was under consideration by the Town Council at their last meeting, a strong protest was entered by Alderman Andrews—a keen critic of business departments—against selling either gas or electricity below cost price. He said a comparison of the figures in the gas account showed that, taking the price all round, it worked out, including all charges, at 2s. 3d. per 1000 cubic feet. They found that nearly one-third of the production had been sold at less than this—in fact, at less than cost price. Something like 67 million cubic feet were sold at 1s. 9d., 51 millions at 1s. 10d., and so on. It seemed to him simply a question of sound business policy that at least they should get the cost price for the whole of the gas made. The smaller consumers, he asserted, had to bear a great deal of the loss made on the sale of gas to the larger users at so low a figure. Mr. Batchelor, the Chairman of the

Gas Committee, denied emphatically that they sold any gas below its actual cost. The price worked out at 1s. 9d. per 1000 cubic feet, while the lowest figure at which any was disposed of was 1s. 10d.; therefore it could not be said that they were selling at a loss. With regard to the cost of production, he pointed out that at the new works and under the improved conditions of manufacture, they would be able to considerably reduce the charges. Dealing with the result of the past year's working, he accounted for the great reduction in profits by three circumstances. In the first place, there had been a decreased consumption by the large manufacturers, owing to slackness in trade; in the second place, there had been an appreciable decline in receipts from the sale of residuals; and, thirdly, the undertaking had to bear increased capital charges arising from the extra expenditure that had been incurred. In the course of the discussion, the hope was expressed that efforts would be made to bring down the price to the small consumers in the coming year; a remark being made to the effect that it seemed as though prepayment meter users are being bled for the benefit of wealthy corporations and great firms. Of course, they are told that without the big consumers it would not be possible to run the department successfully. In reply to this assertion, however, it was argued that the small users were the best customers of the undertaking; and yet the amount of consideration they received at the hands of the Committee was, to say the least, very meagre and disappointing. The Council adopted the report and statement of accounts; and it was decided that £2000 of the £3248 net surplus should be devoted to the relief of the rates, and the balance carried forward to the next account.

THE VALUE OF THE CORRESPONDENCE COLUMN.

Gas v. Electricity at Plymouth.

The references in the speech of Sir Joseph Bellamy, at the annual meeting of the Plymouth and Stonehouse Gas Company, reported in the "Journal" last week, to the unfair competition of the municipal electricity undertaking, has led to some newspaper correspondence. Mr. E. F. Anthony, the Chairman of the Plymouth Corporation Electricity Committee, alluding to the contention of the Chairman of the Gas Company that if it were not for the competition of the municipal electricity undertaking gas would be cheaper—or, as Mr. Anthony puts it, the Gas Company would make larger profits—says it is equally true that if there were no Gas Company the electricity undertaking would make even larger profits than it does now, and the ratepayers would derive greater benefits from the larger profits of their own undertaking than they would from those of the Gas Company. On the question of which is the more economical illuminant, Mr. Anthony contents himself with saying that the answer largely depends on the point of view. He dismisses the medical testimony quoted by Sir Joseph Bellamy as to the advantages of gas over electricity in their effect upon the eyesight by saying that an ounce of personal experience is worth more than a hundredweight of opinion; and he adds: "One has only to try reading or studying by gas and electric light to be convinced that the electric is not only more pleasant to use for the purpose, but much less trying to the eyes." Mr. Anthony hints that his "experience" would be borne out by shareholders in the Gas Company who use electric light in their own homes and offices. Coming finally to the question of the adoption of electric light for one of the schools in the town, Mr. Anthony says: "It is now an established scientific fact that an ordinary incandescent gas-burner consumes in a given time as much air as three ordinary persons. Electric light consumes no air, and has none of the destructive properties of gas. On grounds of health and ventilation, this is a very important point." Mr. Anthony thinks this was what influenced the Committee in the decision to have the school lighted by electricity.

Sir Joseph Bellamy, in replying to the argument of the Chairman of the Electricity Committee about the consumption of air by gas-burners, and the consequent diminution of the quantity of fresh air in a room, quotes an extract from the paper read before the Royal Sanitary Institute by Dr. Samuel Rideal, F.I.C., on "The Relative Hygienic Values of Gas and Electric Lighting."* Dr. Rideal's conclusions were: "The bacterial content of the air of a room is more likely to be reduced by gas than by electric lighting because of (1) the cremation of organisms in the gas-flames, (2) the sterilizing effects of the sulphur acids from the gas, (3) the removal of organisms by the greater condensation on cold surfaces, and (4) the increased ventilation of the room." With regard to the suggestion that shareholders in the Gas Company use the electric light in their own homes and offices, Sir Joseph says that the electric light in Plymouth, where gas is sold at 1s. 9d. per 1000 cubic feet, is a luxury; and gas shareholders, like other people, may indulge in luxuries if they pay for them. A municipal authority, however, ought not to have luxuries at other people's expense. As a ratepayer, and, on behalf of the Gas Company, one of the largest ratepayers in the town, Sir Joseph protests against the waste of money in installing electric light in the schools. He says that he and Mr. Anthony, among others, survived attendance at evening classes in rooms far less luxurious than those now provided and lighted by gas; and he concludes by suggesting that if the supply of electricity were in the hands of the Gas Company, both gas and electric light would be cheaper, while the profits would be circulated among local shareholders instead of being sent out of the town, as is the case with the municipal undertaking.

Cost of Gas and Electricity at Chichester.

In the "Journal" last week (p. 988), we noticed the reply of Mr. T. E. Pye, the Engineer and Manager of the Chichester Gas Company, to some statements made by Mr. H. S. Aylmore, a member of the Corporation, on the occasion of the inauguration of the electricity supply undertaking in the city, on the low cost of electric lighting. Mr. Aylmore promptly replied to Mr. Pye in a letter to the local paper. He admitted that he made a mistake in stating that the light was on for 2½ hours, when it should have been 3¼ hours. Then he said there were some omissions from his speech, which brought up the number of lamps to 17, with 520-candle power; and he asked Mr. Pye to work out another sum by adding three-quarters of an hour to the 2½ hours, and 520-candle power to the 450-candle power mentioned, so that they might compare the result with the cost of gas. He added: "I have already made such comparison, and find that my gas bill for the quarter ending June, 1908, was £3 3s. 11d., or nearly 5s. a week for thirteen weeks; while the cost to me of electric light for fourteen days (June 3 to 17), including four bedrooms, which were never lighted by gas, was 8 units, or 2s. per week. On the other side, the gas bill includes that used in a gas-stove. But surely this does not cost more than 3s. a week; if so, there is not much economy there. . . . As one of the humble representatives in the City Council, may I not ask that the ratepayers should have some share in the advantage of this marvellously cheap gas lighting (hitherto unknown) in the public streets, for which they pay over £1100 per annum—by the Gas Company charging less than £3 10s. per lamp for gas which they can supply to a private consumer at 490-candle power for just under 1d. per hour, and suggest that the better illumination of the Cross clock would be a very good point to start from?"

To this letter Mr. Pye replied in the succeeding issue of the paper. Dealing with the cost of the public lighting, Mr. Pye said: "Mr. Aylmore asks that 'the ratepayers should have some share in the advantage of this marvellously cheap gas lighting (hitherto unknown) in the public streets . . . by the Gas Company charging less than £3 10s. per lamp for gas, &c.' Surely it is a first duty of the Chairman of a Committee to understand the accounts his department are called upon to pay. Chichester has not for years past, if ever, paid £3 10s. per lamp per annum for gas. This charge of £3 10s. is inclusive of all labour and other costs of lighting, extinguishing, and cleaning the lamps, and of glazing, painting, and general maintenance—not to speak of charges to meet depreciation, &c. If Mr. Aylmore will kindly make a calculation allowing for these things—the cost of most of which are published in my Company's half-yearly statements of accounts, and amount roughly to about 24s. per lamp per annum, he will find that the net charge for gas per lamp is about ½d. per hour, which, for 490 to 500 candle power comes out at about 0·9d. per hour. If, further, Mr. Aylmore will give credit for the gratuitous lighting at the Cross clock and elsewhere, which he did not mention in his letter, but which, on the £3 10s. basis, is worth to the City about £56 to £60 per annum, he will find that the City has for some years past been paying for gas for its public lighting, at the rate of 490 to 500 candle power lighting, ⅜d. per hour! I think, with Mr. Aylmore, that this is 'marvellously cheap gas lighting,' upon which the City and its representatives may well be congratulated."

Passing on to deal with Mr. Aylmore's corrections, Mr. Pye said: "Mr. Aylmore asks me to make another calculation on the altered basis. Exactly. Here it is: 450 candles *plus* 520 candles multiplied by 3¼ hours upon 1¾ units of electricity equals 3152½ candle-hours upon 1¾ units. This amounts to 1800-candle power per hour from 1 unit of electricity. This is a marvellous result, truly 'hitherto unknown'! The maximum lighting power of the lamps Mr. Aylmore is using is 760 to 800 candles per hour per unit of electricity consumed, and the average will probably be 700 candles. Will Mr. Aylmore kindly explain where he has picked up that extra 1000 candles? Frankly, Mr. Editor, I knew that the results as originally published in Mr. Aylmore's speech approximated fairly closely to the actual probabilities. Otherwise my earlier letter would not have appeared. Any of your readers can prove this for himself, on the safe basis of (say) 750-candle power per hour per unit, thus: 450 candles multiplied by 2½ hours upon 1¾ units of electricity equals 1125 candle-hours upon 1¾ units equals 643 candles per hour per unit. The difference between this 643 candles and the theoretical 750 to 800 candles may be due to the lighting having been, as Mr. Aylmore thinks, somewhat longer than 2½ hours. However, after the wonderful achievement now claimed by Mr. Aylmore, of 1800 candle-hours from one unit of electricity by Osram and carbon lamps, he need have no further anxiety as to such modest honours as have come my way as a result of my 'sticking to my own business,' and of certain research and constructive work connected with my profession. If he will only show to his friends the electricians how and whence he can obtain lighting at the rate of 1800-candle power from a consumption of one unit of electricity per hour, from the lamps he is now using, the professor's chair in electricity at one of our leading Universities will be the least of the honours that a grateful and, at present, a very anxious profession will desire to confer upon him."

Gas-Works Results at Tipton.—The Gas Committee reported to the last meeting of the Tipton Urban District Council that the gross profit on the gas undertaking for the year ending March 31 last was £5079, and the net profit £271. Out of this, £150 had been handed over to the Council towards the purchase of the mines under Bloomfield Road. Mr. Powell, in moving the adoption of the report, said the depression in trade during the year had resulted in a reduction in the consumption of gas, representing a decline in revenue of £1093 compared with the receipts of the previous year. A further loss of £395 had been sustained by a reduction of 3d. per 1000 cubic feet in the charge for gas for lighting purposes. The resolution was adopted.

Birmingham Coal Contracts.—The "Birmingham Mail" understands that the Gas Department have now placed their contracts for the whole of the 550,000 tons of coal required during the coming year. Mr. G. Hampton Barber, taking full advantage of the state of the market, has succeeded in effecting a saving of £15,000 odd, compared with the prices paid twelve months ago. Having regard to this, and the large profits made by the department last year, it is, says our contemporary, thought that the Gas Committee will consider the question of reducing the price of gas. Other corporations in the Midlands are arranging their contracts; and it is generally understood that the collieries are willing to give a reduction of 6d., but some corporations insist on 9d. Works using a large proportion of gas nuts and slacks will obtain an additional advantage; the reduction on these being greater than on coals.

* See "Journal," Vol. CI., pp. 613, 686.

ELECTRICITY SUPPLY BUSINESS AT WEST HAM.

Referring to the inquiry by Mr. H. Ross Hooper in regard to the application by the West Ham Corporation to the Local Government Board for sanction to the borrowing of £74,600 in connection with the electricity supply undertaking, which was dealt with in "Electricity Supply Memoranda" last week, "The Times" says: "The inquiry has revealed a deplorable condition of affairs; and when it is remembered that West Ham has been engaged in an extended crusade against the measures brought forward by private electricity supply companies for the improvement of supply within the Metropolitan area, it is difficult to estimate the damage that this municipal body has done to the industry and to the ratepayer. The main point now at issue is whether the Corporation has supplied electricity to certain large consumers at so low a price that the present debt, in whole or in part, is the result. If it can be proved that the prices charged are inequitable, then it is clear that grave injustice has been done to ratepayers. Unfortunately, the issue is rendered more complex by evidence to the effect that the Corporation has carried out electrical work beyond the limits of its own borough, and that it has supplied foreign-made cable which might be mistaken for cable made by leading firms in this country except by the experts who were called in and who declared that it was not their own product. Such practices are said now to be discontinued. They may have been unintentional; and it is unnecessary, therefore, to dwell upon them except to indicate that municipal enterprise loses prestige by transactions of this kind. The official inquiry is helpful so far as it goes; but unless it is followed by a reform equivalent to reconstruction, the expenditure of public money will have been to no purpose; for West Ham will probably issue a supplementary rate, and there will be nothing to check the further growth of debt upon the undertaking. The only hope seems to lie in a transfer of the whole electricity supply concern to a private company."

METROPOLITAN WATER BOARD.

Resignation of Lord Welby—The Value of Storage before Filtration.

At the Meeting of the Metropolitan Water Board last Friday, a letter was received from Lord Welby resigning his seat on the Board. The Finance Committee, of which Lord Welby has been Chairman since the inception of the Board, reported that they had placed on record their deep sense of the valuable services he had rendered, and of the great loss the Board had sustained by his resignation. On the motion of the Vice-Chairman (Mr. G. S. Elliott), seconded by Sir Melvill Beachcroft, a resolution was passed expressing regret at Lord Welby's resignation and the Board's deep sense of his services.

The Law and Parliamentary Committee presented a report on the Finance Bill, and, on the recommendation of the Committee, it was agreed, without discussion—"That the Law and Parliamentary Committee be authorized to take such steps as may be necessary with the view of obtaining amendments of the Finance Bill, 1909, to (*a*) clearly define the position of the Board as a 'rating authority,' and (*b*) bring such lands of the Board as are actually being utilized, or in future will be utilized, for the purposes of their undertaking within the exemption contained in clause 25 of the Bill."

The Water Examination Committee reported that the fourth report of the Director of Water Examination (Dr. A. C. Houston) on research work, dealing with the vitality of the cholera vibrio in artificially infected samples of raw Thames, Lea, and New River water, with special reference to the question of storage, was of a reassuring character. It indicated clearly that when samples of river water were stored in the laboratory after being artificially infected with millions of cholera vibrios, the vast majority died within a week. The results strengthened the evidence previously adduced in favour of storage, and appeared to show that by adequate storing of raw impure river waters, before their filtration, the safety of the Metropolis, as regards water-borne epidemic disease, was almost, if not quite, assured.

The return relating to the supply of water for May showed that the average daily quantity sent out was 239,336,000 gallons; the supply per head per day being 33·9 gallons, compared with 32·1 gallons in May last year. The quantity of water in store in impounding reservoirs at the end of the month was 8569 million gallons; the corresponding figure for 1908 being 8011 million gallons.

The Board decided, by a considerable majority, to hold their meetings monthly instead of fortnightly.

A NEW RESERVOIR AT HULL.

The annual visit last Wednesday of the members and officials of the Hull Corporation to the water-works was taken advantage of to perform the opening ceremony in connection with a new reservoir which has just been completed at Keldgate, near Cottingham, at a cost of £43,000. The reservoir, which was designed by the late Water Engineer, Mr. F. J. Bancroft, before he left Hull to go to New Barnet, is founded on the chalk formation, with a top-water level of 140 feet above Ordnance datum. It is constructed of concrete, with a lining of bitumen sheeting; and 361 piers carry the cross walls, from which the arches of the roof spring. The internal dimensions are 324 ft. by 324 ft., and 16 ft. deep. More than 90,000 tons of material were excavated; and about 4000 tons of portland cement were used in the work. The reservoir is supplied with water by a 30-inch branch-main, 2 miles in length, from the Cottingham pumping-station.

Those present at the ceremony included the Mayor and Mayoress (Alderman and Mrs. Feldman), Mr. J. H. Hargreaves (the Chairman of the Water Committee) and Mrs. Hargreaves, and Mr. C. B. Newton (the Water Engineer). They drove to the pumping-station at Springhead, and thence to Keldgate, where they were met by Mr. Shardlow, one of the Directors of Messrs. Moss and Sons, of Loughborough, the Contractors, and Mr. H. Hill, the Clerk of the Works, who conducted them underground and into the empty reservoir, which has a capacity of 10 million gallons. Upon returning to the valve-house, the Mayoress was presented by Mr. Shardlow with a handsome bouquet and a golden key; and she then performed the ceremony of turning on the water. The Mayor said that the object of the reservoir was to make the pressure uniform throughout the 24 hours—to give the same supply during the night as during the day—and thus obviate a good deal of night pumping. The growing demands of the city had rendered the work essential; and it had the entire approval of the Local Government Board. Some 10 acres of land had been purchased by the Corporation, of which the reservoir absorbed 5½ acres; so that a good deal remained in reserve for future extensions. Hull was singularly fortunate in having a supply of water at her very doors; and it was distributed to manufacturers at a price which would compare very favourably with most towns and cities in the kingdom.

The work was named the Keldgate reservoir by Mrs. Hargreaves; and formal votes of thanks were tendered the two ladies who had taken so prominent a part in the day's proceedings. From Keldgate, the party drove to Cottingham, where luncheon was served in the grounds of the pumping-station.

The area of the district supplied by the Hull Corporation is 16,377 acres, or 25·59 square miles, containing a population of 276,750. In addition, the Corporation supply water in bulk to the district of Cottingham, as well as to that of Sutton. The total length of mains on Dec. 31, 1908, was 259 miles; and the quantity of water pumped last year was 3,846,178,000 gallons—the average daily supply for all purposes being 10,421,000 gallons, or 37·65 gallons per head.

NOTES FROM SCOTLAND.

From Our Own Correspondent. *Saturday.*

In the minutes adopted by the Edinburgh and Leith Gas Commissioners at their meeting on Monday last, it was stated that the purchases of coal at the previous meeting amounted to 234,000 tons in all. The Treasurer, Mr. John S. Gibb, laid on the table a copy of the annual accounts; and they were remitted to the Finance Committee. Bailie Inches said that the gross profit on the year's working amounted to nearly 7 per cent. on the capital of the undertaking. From the printed slip that had been circulated by the Treasurer, it would be seen that the Commissioners had more than been able to meet their financial obligations; for, in addition to all the usual charges for interest and sinking fund and other purposes, they had succeeded in providing for a contribution of £10,000 to be placed to the reserve fund, and, further, they had charged to the revenue account a large sum as against the cost of the reconstruction of the general offices. Very little—only £1883—had been added to the capital account of the works and plant during the past year; and it was worthy of announcement that, so far as further capital expenditure was concerned, little, if any, need be expended unless unexpected developments took place in the consumption of gas. Anything that might be required for some years to come would be of the nature of a renewal or replacement, and, as such, was chargeable to the current revenue or to the reserve fund, for which purpose this fund was now being accumulated. With this year's contribution it amounts to £28,688; and as the Commissioners have come under a statutory obligation to contribute annually to this fund to the extent of 2d. per 1000 cubic feet of gas, which is equivalent to (say) £16,000 a year, there is every prospect of the fund being sufficient to meet the ordinary developments of the undertaking. The consumers would no doubt be pleased to learn that the manufacturing costs were such as to warrant the Commissioners reducing the price of gas by 2d. per 1000 cubic feet in the early autumn, which would have the result of taking £16,000 off their next year's gas bills; and the Commissioners were to consider the possibility of making a special rate for gas used in engines. Lord Provost Gibson said they were very much obliged to the Convener for the statement. Provost Smith, of Leith, suggested that a special rate might also be arranged for gas used in heating. The subject was continued for consideration. Mr. Herring, the Gas Engineer, was instructed to make experiments with vertical retorts.

The Directors of the Galashiels Gaslight Company, in their annual report, state a profit for the year of £2150, which, with a reserve fund of £7058, makes a sum of £9208 available for distribution. It is recommended that a dividend of 10 per cent., free of income-tax, be paid, and that the balance of £7108 be placed to the reserve fund. The quantity of gas made during the year was 72 million cubic feet. There was unaccounted-for gas to the amount of 3,537,567 cubic feet; and 720,000 cubic feet were used in the works. The gas accounted for—67,742,433 cubic feet—was 505,417 cubic feet less than in the previous year. The price of gas is to be continued at 2s. 9d. per 1000 feet. The Directors visited the works on Monday, and found them in excellent order.

The report of the Cupar Gas Company, Limited, states that the amount at the credit of the profit and loss account for the year is £1086, exclusive of a balance of £377 brought forward. The Directors recommend dividends at the rate of 5 per cent. on the preference stock, and of 37s. 6d. per share, free of income-tax, on the ordinary stock. They propose to allow £400 for depreciation, and to carry forward £339. It is also recommended that the price of gas be reduced to 3s. 10½d. per 1000 cubic feet on all amounts paid within one month from the date of survey; and that 2½d. per 1000 cubic feet of additional discount be allowed on all ordinary accounts of £15 and upwards per annum.

At the Inverkeithing Town Council last night, a Committee reported having considered letters from the Gas Company offering to sell their undertaking to the Council for £2500, and that they were of opinion that the price named was out of the question. They recommended that the Council decline to entertain the proposal. Provost Niven explained that it was not meant that all negotiations should cease. The Company would perhaps alter their figure. The recommendation was adopted.

The Directors' report of the Leslie Gaslight Company shows a profit for the past year of £222. A dividend of 7½ per cent. is provided for. During the year £247 was spent upon repairs to works and plant. A

new gasholder has also been erected, at a cost of £914, to meet the cost of which £1000 was raised on 4 per cent. debentures.

The East Wemyss and Buckhaven Gas Company, Limited, are about to erect a new gasholder, of 100,000 cubic feet capacity. The contract for the work has been let to Messrs. Henry Balfour and Co., Limited, of Leven.

At the annual meeting of the Pittenweem Gaslight Company, the Chairman—Mr. J. Henderson—stated that the year had been rather an adverse one all round, but the Company had maintained their sound financial position in a most marked degree. The funds in hand amounted to £276; and the Directors recommended a dividend at the rate of 10 per cent. It was agreed to retain the price of gas at 4s. 2d. per 1000 cubic feet, and the same rate of hire for meters.

The annual meeting of the Carluke Gas Company, Limited, was held on Monday evening. The report of the Directors stated the profits for the year at £729, and recommended a dividend of 2s., with a bonus of 6d., per share, and the carrying forward of £104. The financial statement showed an income of £3038, and an expenditure of £2309. The Directors' report and recommendations were approved by a majority. The shareholders recommended the Directors to abolish meter-rents.

The Treasurer of the Edinburgh and District Water Trust—Mr. W. Anderson—has prepared the abstract of accounts of the Trust for the year ending at May 15. The income from water-rates was estimated at £171,321; and there had been realized £172,412. The expenditure was estimated at £159,548; the actual expenditure had been £157,815. The capital expenditure for the year amounted to £22,039. At May 15, the total capital expenditure of the Trust had amounted to £2,795,836; and of this sum, £357,803 had been paid off by means of the sinking fund. Among the items of expenditure in the year were: Feu-duties, rents, and taxes, £19,501; interest, £66,976; annuities, £23,575; contribution to suspense account, £14,504; and contribution to sinking fund, £19,543.

On Wednesday, the Corporation of Arbroath paid their first official visit of inspection to the new Noran Water-Works since their opening. At the luncheon, which was provided by the Town Clerk—Mr. W. K. Macdonald—Provost Alexander proposed the toast of "The Water-Works," and Bailie Robertson, the Convener of the Water Committee, in response, said that the construction of the water-works was now completed. The cost of the works was estimated by the Engineer—Mr. C. P. Hogg, C.E., of Glasgow—at £86,000; and the work had been carried out for £88,000. He was happy to say that this year there would be a reduction in the water-rate of 1d. in the pound. The Company pledged the health of the Town Clerk and the Provost.

Mr. Andrew Hogg writes that the report of the Leven and Methil Gas Company, Limited, of which he is Chairman, published in last week's "Notes" is incorrect, and must refer to some other Company. He adds that a correct account of the Company's meeting appeared in the "JOURNAL" for the 22nd ult. (p. 910).

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *July* 3.

During the week the market has continued quiet. On the one hand, buyers have shown little disposition to operate, while, on the other hand, there has not been any pressure to sell. Consequently, the values remain unchanged at £11 2s. 6d. f.o.b. Hull, £11 3s. 9d. to £11 5s. f.o.b. Liverpool, and £11 7s. 6d. per ton f.o.b. Leith. In the forward position, there is no new feature to comment upon; makers still holding out for a substantial premium on the spot prices for distant delivery.

Nitrate of Soda.

This article remains without change at 10s. 3d. per cwt. for ordinary quality, and 10s. 6d. for refined, *ex* store Liverpool.

Tar Products. LONDON, *July* 5.

There has been very little change in the markets for tar products during the past week. Pitch continues firm, and it now remains to be seen whether the market in South Wales will improve, seeing there is not likely to be a coal strike. Creosote is steady, and there have been one or two fresh inquiries for prompt and delivery over the next few months. Benzol is steady, and there are several inquiries for delivery over the next twelve months. Toluol is quiet, and there have been one or two inquiries for forward delivery; but makers do not feel inclined to sell ahead. In solvent naphtha, there is very little further business doing. Crude carbolic is decidedly weak, and business can probably be done on the east coast at 11½d. to 1s.

The average values during the week were: Tar, 14s. 6d. to 18s. 6d., *ex* works. Pitch, London, 28s.; east coast, 27s. 6d. to 28s.; west coast, 26s. 6d. to 27s. 6d. f.a.s. Mersey ports, 26s. to 27s. f.o.b. others. Benzol, 90 per cent., casks included, London, 6d. to 6½d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6¾d. to 7d. Toluol, casks included, London, 8¼d. to 8½d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3⅛d.; solvent naphtha, casks included, London, 10¾d. to 11¼d.; North, 9½d. to 10d.; heavy naphtha, casks included, London, 10½d. to 11d.; North, 9½d. to 10½d. Creosote, in bulk, London, 2¾d. to 2 13/16d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2⅞d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 11½d. to 1s.; west coast, 11d. to 11½d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

There is practically no alteration in this article, and the market is certainly quiet. Beckton terms are £11 7s. 6d.; and ordinary makes on Beckton terms, £11 to £11 2s. 6d. Hull is £11 to £11 2s. 6d.; and Liverpool £11 2s. 6d. to £11 3s. 9d. In Leith, the price is £11 6s. 3d. to £11 7s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade in the North has been influenced by the crisis in Wales, and prices rose with some sharpness when it was anticipated that there might be a serious stoppage in the production. After the decision in South Wales, prices fell irregularly. Best Northumbrian steams may be quoted at somewhere near 12s. to 12s. 3d. per ton f.o.b.; but a few days will be needed to allow normal conditions to rule. Second-class steams are about 11s. per ton; and steam smalls from 5s. to 6s. In the gas coal trade, there is a steady output, which is well taken up; and, as the period of the smallest home consumption has now passed, and it must soon begin to increase, that production should be met by a rather fuller demand. The gas coal trade did not show the advances in price at the end of June that steam coal knew; and thus there has not been any fall of importance. Durham gas coal varies, according to quality, from about 9s. 9d. to 11s. per ton f.o.b. for the usual classes; and up to 11s. 6d. for "Wear specials." Contracts have been few; but forward orders for moderate quantities are being placed at near current prices, though buyers do not readily give these rates for far forward delivery. In coke, the market is quiet; but gas coke is steady at from about 12s. 6d. to 13s. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade is quieter; the belief gaining ground that the differences between masters and men will be got over without resort to a strike. The rush to obtain additional supplies has therefore lessened. The eight-hours day is now being worked. As yet, however, its effect upon prices is not apparent. The quotations are: Ell 9s. 9d. to 11s., splint 10s. 3d. to 10s. 6d., and steam 9s. to 9s. 3d. per ton f.o.b. Glasgow. The shipments for the week amounted to 360,028 tons—an increase of 10,437 tons upon the previous week, and of 19,578 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,047,478 tons—an increase of 522,197 tons upon the corresponding period.

Assessment of the Honor Oak Reservoir.—It was agreed last Friday that the new Honor Oak reservoir, which is in the borough of Camberwell, should be assessed at a rateable value of £7886. The Borough Council thus secure one ratepayer whose annual contribution will come to nearly £3000.

Water Diviner's Successes.—Mr. H. W. Golding, the Chairman of the Bocking Rural District Council, who has taken up water divining as a hobby, has had some striking successes. One of the largest local farmers, after sinking several useless wells, was prevailed upon to consult Mr. Golding. At one place which the latter indicated, a spring was found at 30 feet below the surface, and at another an almost unlimited supply of water was struck.

The Calcutta Lighting Contract.

The "Statesman" newspaper (Calcutta), of the 15th ult., published the following: At their meeting last evening, the Special Committee of the Calcutta Corporation appointed to consider and report on matters between the Corporation and the Gas, Tramways, Telephone, and Electric Light Companies considered the question of remuneration to be paid to Mr. Mansfield, the gas expert, for his work in regard to the testing of the lights, and for his advice on various matters in dispute between the Gas Company and the Corporation in connection with the lighting of the city. The Committee resolved to recommend to the Corporation for sanction that a sum of 1000 guineas be paid to Mr. Mansfield for his entire services in connection with the gas contract. Mr. Mansfield had applied for this amount being granted to him as remuneration; and his request was supported by the Chief Engineer.

Natural Gas in Canada.—The Canadian Agency in London have received a despatch from Edmonton, Alberta, stating that, after several years of unsuccessful endeavour, natural gas has been struck at Calgary, at a depth of about 2800 feet. The well is said to be flowing at the rate of a million cubic feet per day. The despatch adds that it is still too early to pronounce with certainty on the permanence of the supply; but, judging from experience at some of the large wells in the east of the province, the present strike is a very important one.

Unwholesome Water at Wickham.—It having been ascertained by the Rural District Council at Fareham that 51 houses were receiving unwholesome water at Wickham, the Clerk was instructed to communicate with the owners with the view of their taking supplies from the mains of the Gosport Water Company, which now pass through the district. As to analyzing the water, the Local Government Board have informed the Council that the cost must be borne by them, and not by the owners. The water at Wickham is obtained partially from wells and partially from the river and streams, which have the reputation of being infected.

Liquidation of Moffat's Limited.—At an adjourned meeting of the creditors of Moffat's Limited, held last Thursday, the Liquidator (Mr. R. H. Nerney) stated that the total assets amounted to £25,968, including £13,887 for goodwill and patents. He estimated that there was at present a surplus of £9431. It had been anticipated that the Liquidator would put before the creditors a scheme of reconstruction; but Mr. Nerney stated that he was not in a position to make any statement. Some dissatisfaction was shown that he was unable to report more definitely, after having had a month in which to arrange matters. An opinion was expressed that a joint Liquidator should be appointed to act with Mr. Nerney on behalf of the trade creditors; it was eventually resolved to appoint a Committee, consisting of the four largest trade creditors, to confer with the Liquidator and report to the general body of creditors from time to time.

Sales of Shares.—Last Tuesday, Messrs. E. J. Brooks and Son sold £100 of ordinary stock of the Oxford Gas Company for £126 10s.; and £100 of preference stock of the same Company for £114. On Thursday, Mr. A. G. Brown sold two fully-paid £25 shares in the Oundle Gas Company at £52, four at £55, and two at £56.

Gas v. Steam for Pumping.—At the last meeting of the Epsom Urban District Council, the Water Committee reported that the Consulting Engineer stated that the total cost of pumping by steam for the year ended March 31, 1907, was £1295, and by suction gas for the year ended March 31 last, £923. This showed a saving of £372; and he added that, if all the water could have been pumped by the gas plant, a further £142 would have been saved.

New Joint-Stock Companies.—The British Patent Oxide Company, Limited, has been formed with a capital of £12,000 in £1 shares, to acquire and turn to account certain patents for inventions relating to the making of red oxide of iron and other substances, &c., and to adopt an agreement with J. Gill. The Carbide Trading Company, Limited, has been formed with a capital of £20,000, in £1 shares, to carry on the business of dealers in carbide of calcium and bye-products and chemicals of all kinds, &c.

Suicide of a Former Gas Official.—A Coroner's Jury at Swindon last week returned a verdict of "Suicide while insane" in the case of Mr. John Wynn, a well-known resident of the town, whose decapitated body was found on the Great Western Railway. No light was thrown on deceased's movements immediately before the occurrence; but Dr. Maclean said he had been attending him for eighteen months for nervous debility and insomnia of an aggravated nature. Mr. Wynn, who was about 54 or 55 years of age, formerly resided in America, and was for some time agent for the New York Life Assurance Company. Previously he had been with the Cheltenham Gas Company, and also with a gas engineering firm at Warrington. He leaves a widow (who is an invalid) and three grown-up children. Deceased was at one time proprietor of the Dumfries Hotel, St. Mary Street, Cardiff.

Suicides by Coal Gas.—Last Wednesday, an inquest was held on the body of Henry James Fuller (60), a retired Liverpool clothier, who was found on the previous morning dead in the bath room in the house where he lodged in Chester. Deceased had suffered from paralysis, for which he had been medically attended. When found by the police, he was lying with his head and neck supported by a bundle of cloth. The end of an india-rubber tube connected with the gas-bracket was in his mouth, and his head and face were covered with a coat. The window was closed and the door stopped up with a towel. The Jury returned a verdict to the effect that deceased committed suicide by inhaling coal gas, and that he was of sound mind at the time. A man named Sanderson (47), a labourer residing at Prince's Street, Hull, was found last Friday morning lying upon a couch in his room quite dead. His head was in a pillow-case in which was the end of a tube fixed to a gas-bracket fully turned on. Deceased had been drinking heavily. There was every appearance of determined suicide.

Plymouth Water Supply.—The members of the Plymouth Corporation and the officials recently paid a visit to the water-works, and carried out the time-honoured ceremonies connected with the "fyshinge feaste." As usual, a luncheon followed the gathering at the storage reservoir, where the memory of Sir Francis Drake was drunk in the water which he gave to Plymouth. Alderman R. W. Winnicott, the Chairman of the Water Committee, in reviewing the progress of the undertaking, said it was eleven years since the Burrator storage reservoir was built. Since that time, the mains had increased by 25 miles, and their length was now $135\frac{1}{2}$ miles; while the number of supplies had risen from 16,500 to 20,830. The water revenue had grown from £23,299 to £32,440, and the gross profit from £12,119 to £22,763. It was estimated that this year the sum of £6038 would be paid in relief of the rates, compared with £3211 ten years ago. A gratifying feature was the fact that the consumption of water per head had been reduced from 46·43 gallons to 38·04 gallons, which was equal to a saving of more than a million gallons per day. If the waste had not been checked, they would have had to lay another pipe to carry the water to the town; and if they were to postpone the expenditure on an additional main, the efforts for the prevention of waste must be continued. They were indebted to the Water Engineer (Mr. F. Howarth, M.Inst.C.E.) for much good work in this and other directions.

APPLICATIONS FOR LETTERS PATENT.

14,441.—Newhouse, W. A., "Flexible metallic tubing." June 21.
14,508.—Ewing, W., "Gas-retorts." June 21.
14,517.—Margreth, J., "Acetylene-burners." June 21.
14,543.—Grono, H., and Stöcker, K., "Coke-quenching apparatus." June 21.
14,702.—Alexander, W., "Rotary pump or blower." June 23.
14,707.—Godelmann, N., "Mantles and supports." June 23.
14,758.—Hibberd, C. E., "Coin-freed mechanism." June 23.
14,775.—Hamilton, J. H., "Internal combustion engines." June 24.
14,863.—Mower, G. A., and Taylor, J. H. M., "Stop and full-way valves." June 26.
14,903.—Stone, S., "Gauges for indicating the quantity of liquid and pressure in reservoirs and the like." June 26.
14,908.—Crossley, K. I., and Atkinson, J., "Governing internal-combustion engines." June 26.
14,909.—Poleschowsky, J., "Gas-burners." June 26.
14,915.—Richmond, W., "Joints or unions for pipes." June 26.
14,938.—Jung, B., "Mantles." June 26.
14,947.—Gutehoffnungshütte, Aktienverein für Bergbau und Hüttenbetrieb, "Gas-producers." June 26.
14,954.—Durand, L. E. A., "Gas-engines." June 26.
14,973.—Blake, E. W., "Gas-regulators." June 26.

At the meeting of the Water Committee of the Oldham Town Council last Wednesday, the General Manager (Mr. A. Andrew) reported that the profit on the undertaking for the year ended March 25 was £7122, compared with £7319 the previous year. The strike in the cotton trade was considered fully sufficient to account for the falling off.

The Highways Committee of the Finchley Urban District Council have received a communication from the Royal Automobile Club with regard to a proposal from the Gaslight and Coke Company to paint with an improved mixture of oil and gas tar for experimental purposes a length of road in the district. The Committee have decided to recommend that the Surveyor (Mr. C. J. Jenkin) be authorized to carry out the experiment in Great North Road. The District Council have had under consideration the question of tar-painting the main roads; but they have refused the terms offered by the Middlesex County Council, on the ground that they are inadequate.

We learn from Messrs. J. & W. B. Smith, of Farringdon Road, E.C., that an eminently successful installation of "Graetzin" high-pressure gas-lamps has just been carried out by the North Middlesex Gas Company on the premises of Freeman, Hardy, and Willis.

Last Friday the Manchester Gas Committee placed their contract for their supply, during the next two years, of North American gas oil for their carburetted water-gas plant. The total ordered is 5 million gallons; and a Manchester paper says the Committee have been able to buy this for £15,000 less than they paid last year.

The Portsea Island Gas Company have received notice from the Admiralty that they intend to resume possession of the entire waterside frontage at Rudmore, at which the coals of the Company have hitherto been landed. The land will be utilized for docking purposes; but the Company are still in a position to receive a full supply of coal at their new works at Hilsea.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

Manager and Engineer. Isle of Thanet Gas Company. Applications by July 15.
Retort-House Foreman. No. 5111.

Situations Wanted.

Manager or Assistant. No. 5112.
Secretary, Manager, or Accountant. W. B. Mimmack, St. Paul's Cray.
Sulphate Leadwork. Leadburner, 117, Gallaway Road, Shepherd's Bush.

Stocks and Shares.

Enfield Gas Company. July 13.
Epsom and Ewell Gas Company. July 26.
Harrow Gas Company. July 13.

Stocks and Shares—*continued.*

Hertford Gas Company. July 13.
Ware Gas Company. July 13.
West Kent Gas Company. July 13.

TENDERS FOR

Coal and Cannel.

Belfast Gas Department. Tenders by July 15.
Goole Urban District Council. Tenders by July 21.
Lymm Urban District Council. Tenders by July 21.
Malton Gas Company. Tenders by July 12.
Pembroke Docks Gas Company. Tenders by July 15.
Stratford-upon-Avon Gas Department. Tenders by August 21.
Stretford Gas Company. July 10.

Pipes, &c., and Pipe Laying.

Ashford Gas Department. Tenders by July 20.
Bethesda Urban District Council. Tenders by July 15.
Prescot Gas Company. Tenders by July 13.

Tank (Lead Lined).

Canterbury Gas and Water Company. Tenders by July 10.

Tar and Liquor.

Altrincham Gas Company. Tenders by July 14.
Coventry Gas Department. Tenders by July 19.
Longton Corporation. Tenders by July 20.
Lymm Urban District Council. Tenders by July 21.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 19.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17½—18	..	5 11 1
298,955	10	,,	7	Do. 7 p.c.	12½—13	..	5 7 8
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd. . . .	5½—5¾	..	5 12 7
40,000	5	,,	6½	Do. New. £4 paid .	4⅛—4⅜	..	5 18 10
50,000	10	Feb. 25	14	Bournemouth Gas and Water 10 p.c. . .	28¾—29¼	..	4 15 9
51,810	10	,,	7	Do. B 7 p.c. .	16¾—17	..	4 2 4
53,200	10	,,	6	Do. Pref. 6 p.c.	15⅝—15⅞	..	3 15 7
380,000	Stk.	,,	12½	Brentford Consolidated	253—256	+1	4 17 8
300,000	,,	,,	9½	Do. New . . .	194—196	..	4 16 11
50,000	,,	,,	5	Do. 5 p.c. Pref. .	122—124	..	4 0 8
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	100—102	..	3 18 5
220,000	Stk	Mar. 12	10¾	Brighton & Hove Orig.	212—214	..	5 0 6
246,320	,,	,,	7¾	Do. A Ord. Stk. .	154—156	..	4 19 4
460,000	20	Apl. 16	10	British	42½—43½	..	4 11 11
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c. . .	119—121	..	4 19 2
165,700	,,	,,	4½	Do. B 3½ p.c. . .	89—91	..	4 18 11
82,278	,,	,,	5½	Do. C 5 p.c. . .	108—110	..	5 0 0
55,000	,,	June 25	3½	Do. 3½ p.c. Deb. .	88—90*	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13¾—14¼	..	4 18 3
250,000	Stk.	June 25	4	Do. 4 p.c. Deb. .	92—94*	..	4 5 1
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48—49	..	6 2 5
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	80—82*	+2	5 9 9
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord. . .	109—111	..	4 10 1
1,493,280	Stk.	Mar. 12	5 2/10	Commercial 4 p.c. Stk. .	108—110	..	4 14 6
560,000	,,	,,	5	Do. 3½ p.c. do. .	104—106	+1	4 14 4
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	96—98	..	5 2 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137—139	..	5 0 9
492,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord. .	100—102	..	4 18 0
486,090	10	Jan. 28	12	European, Ltd. . . .	24¼—24¾	..	4 17 0
354,060	10	,,	12	Do. £7 10s. paid.	18½—19	..	4 14 9
15,161,545	Stk.	Feb. 11	4/10/8	Gas light and Coke 4 p.c. Ord. . .	103—104	..	4 7 0
2,600,000	,,	,,	3½	Do. 3½ p.c. max. . .	88—89	..	3 18 8
3,799,735	,,	,,	4	Do. 4 p.c. Con. Pref.	105—107	..	3 14 9
4,193,975	,,	June 11	3	Do. 3 p.c. Con. Deb.	84—86	..	3 9 9
258,740	Stk.	Mar. 12	4¾	Hastings & St. L. 3½ p.c.	93—95	..	5 0 0
82,500	,,	,,	6¼	Do. do. 5 p.c	118—120	..	5 4 2
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17½—18	..	6 2 3
123,570	Stk.	Mar. 12	6½	Ilford A and C . . .	141—143	+1	4 10 11
65,780	,,	,,	5	Do. B	106—108	..	4 12 7
63,000	,,	June 25	4	Do. 4 p.c. Deb. . . .	102—104*	+2	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental .	179—181	..	4 8 5
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c. .	120—122	..	4 18 4
561,000	Stk.	Feb. 25	10	Liverpool United A .	226—228	..	4 7 9
718,100	,,	,,	7	Do. B . .	168—170	..	4 2 4
306,083	,,	June 25	4	Do. Deb. Stk.	103—105*	..	3 16 2
75,000	5	June 11	6	Malta & Mediterranean.	4¾—5	−⅛	6 0 0
560,000	100	Apl. 1	5	Met. of Melbourne 5 p.c. Deb.	100—102	..	4 18 1
250,000	100	,,	4½	Do. 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	May 27	3½	Monte Video Ltd. .	12½—13	..	5 7 8
1,775,892	Stk.	Feb. 25	4½	Newc'tle & G't sh'd Con.	106½—107½	..	4 3 9
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	91—92	+¼	3 16 1
15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½—20	..	5 0 0
55,940	10	,,	7	Do 7 p c	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	137—139	..	5 15 1
60,000	5	Mar. 31	8	Ottoman, Ltd. . . .	6⅛—6⅜	+⅛	6 5 6
31,800	53	Feb. 25	13	Portsea Island A. . .	137—139	..	4 19 0
60,000	50	,,	13	Do. B. . .	129—131	..	4 19 3
100,000	50	,,	12	Do. C. . .	119—121	..	4 19 2
114,800	50	,,	10	Do. D and E.	101—103	..	4 17 1
398,490	5	May 13	7	Primitiva Ord. . . .	6¾—7	..	5 0 0
796,980	5	Jan. 28	5	Do. 5 p.c Pref. .	5¼—5½	..	4 10 11
483,900	100	June 1	4	Do. 4 p.c Deb. .	94—96	..	4 3 4
1,000,000	10	Apl 29	8	River Plate Ord. . .	14¾—15¼	..	5 4 11
312,650	Stk	June 25	4	Do 4 p.c. Deb. .	96—98*	+3	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	14—14½	.	5 10 4
62,500	10	,,	6	Do 6 p.c. Pref. .	12—12½	+¼	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49½—50½*	+¼	4 19 0
135,000	Stk.	Mar. 12	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	233—235	..	4 5 1
523,500	,,	,,	10	Do. C	233—235	..	4 5 1
70,000	10	June 11	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Feb 11	5/6/8	South Met., 4 p.c. Ord.	122—124	..	4 6 0
1,895,445	,,	Jan. 14	3	Do. 3 p.c. Deb.	85—86	..	3 9 9
209,820	Stk.	Mar. 12	8	South Shields Con. Stk.	152—154	..	5 3 11
605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120—122	..	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref. .	122—124	..	4 0 8
117,058	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124—126	..	3 19 4
502,310	Stk.	May 13	5	Southampton Ord. . .	110—112	..	4 9 3
120,000	Stk.	Feb. 25	6¾	Tottenham and Edmonton A 5 p.c. .	132—134	..	5 0 9
423,940	,,	,,	5¼	Do. B 3½ p.c. .	111—113	..	4 12 11
149,470	,,	June 25	4	Do. 4 p.c. Deb.	99—101*	..	3 19 3
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101*	+½	4 19 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	109—111	..	4 10 1
255,636	Stk.	Feb. 25	6½	Wandsworth B 3½ p.c. . .	139—141	..	4 12 2
79,416	,,	June 25	3	Do. 3 p.c. Deb. Stk.	73—75*	..	4 0 0
895,872	,,	Feb. 25	5¼	West Ham 5 p.c. Ord. .	121—123	..	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref. . .	126—128	..	3 18 2
253,300	,,	June 25	4	Do. 4 p.c. Deb. Stk..	105—107*	..	3 14 9

Prices marked * are "Ex div."

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Apply, by letter, to No. 5111, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

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THE Directors of the above Company are prepared to receive APPLICATIONS for the Appointment of MANAGER and ENGINEER.

The make of Gas last Year was 315 Millions.

Candidates must possess a thorough knowledge of the Manufacture and Distribution of Gas in all its Branches, the Working of Inclined Retorts, Manufacture of Sulphate of Ammonia, and a thorough knowledge of the Commercial Management of a Gas-Works.

Salary, £365 per Annum, inclusive.

Age 30 to 40. Total Abstainer preferred.

Applications, in Candidates own Handwriting, stating Experience, and enclosing *copies* of Testimonials (which will *not* be returned), to be sent to these Offices addressed to the Chairman not later than Thursday, July 15, 1909.

Canvassing directly or indirectly will disqualify.

By order,
Thos. Fuller, F.C.I.S.,
Secretary.

Company's Offices, Addington Street,
Margate, July 2, 1909.

PURIFIERS—Set of Four, 12 feet Square, fixed complete, £300. A bargain. Also Four 6 feet Square, Two 8 feet, Four 8 feet, and Two 12 feet square PURIFIERS. Cheap.

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Firth Blakeley's, Thornhill, Dewsbury.

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Firth Blakeley's, Thornhill, Dewsbury.

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Further Particulars, if required, may be had from the Company's Engineer.

Tenders to be sent in on or before Saturday, the 10th of July, 1909.

James Burch,
Secretary and General Manager.

BOROUGH OF LONGTON.

THE Gas and Electricity Committee invite TENDERS for the Surplus TAR produced at these Works during the Year ending June 30, 1910.

Further Particulars may be obtained on Application to the undersigned.

Tenders, endorsed "Tender for Tar," to be sent in addressed to the Chairman of the Gas and Electricity Committee not later than Tuesday, July 20, 1909.

W. Langford,
Engineer and General Manager.

Gas and Electricity Works,
Longton.

ALTRINCHAM GAS COMPANY.

TENDERS FOR TAR.

THE Directors invite Tenders for the Surplus TAR produced at their Works between July 1, 1909, and June 30, 1910.

Estimated Quantity, 1100 Tons.

Delivery, at the option of the Gas Company, either into Contractor's Tank-Waggons or Gas Company's Tank-Waggons at Altrincham Station, or in Contractor's Barrel Carts at the Gas-Works, and separate Prices to be given in each case.

Sealed Tenders, addressed to the Chairman, and endorsed "Tender for Tar," to be delivered not later than Noon on Wednesday, July 14.

J. E. Lamb,
Manager.

Gas Office, Altrincham,
June 29, 1909.

BETHESDA URBAN DISTRICT COUNCIL.

THE Bethesda Urban District Council invite TENDERS for the Supply of MATERIALS and EXECUTION OF WORK required in Connection with the LAYING of about 3000 Yards of GAS-MAINS, and the addition of 50 STREET LAMPS.

Plans and Specifications may be inspected at my Office during Office hours (Ten a.m. to Five p.m.) from July 7 to 11 inclusive.

A Copy of the Specifications will be forwarded to Firms proposing to Tender on receipt of a Deposit of 10s. 6d. which will be returned on receipt of a *bonâ-fide* Tender.

The Council do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Gas-Mains Extension," to be delivered to me not later than Ten a.m. July 15, 1909.

(Signed) D. Griffith Davies,
Clerk.

Council Offices, Bethesda,
July 3, 1909.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to receive TENDERS for the Supply of CANNEL and Best Screened GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of Twelve Months from the 1st day of September, 1909.

The probable Quantities required will be about 300 Tons of Cannel and about 2000 Tons of Gas Coal, which must be Freshly-Wrought, well-Screened, and free from Sulphurous Pyrites and other objectionable matter; but the Council reserve the right of increasing or decreasing the Quantities named.

The person whose Tender is accepted will be required to enter into an Agreement with the Council for the due performance of his Contract.

Sealed Tenders, stating Price per Ton delivered by Boat alongside the Works, to be sent to the undersigned on or before the 21st day of July, 1909, and endorsed "Coal Tender."

The Council do not bind themselves to accept the lowest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to the Gas Manager, Mr. W. L. Donaldson.

W. Mullard,
Clerk.

Council Offices, Lymm,
Cheshire, June 30, 1909.

TAR AND AMMONIACAL LIQUOR.

THE Lymm Urban District Council are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works, for a term of One Year from the 1st day of September, 1909 (or for such longer term as may be contracted for with the consent of the Council).

Tar and Liquor will be delivered free into Contractor's Boat on the Bridgewater Canal.

Tenders to be sent to the undersigned on or before the 21st day of July, 1909, endorsed "Tar."

The purchaser will be required to enter into an Agreement with the Council for the due performance of his Contract.

The Council do not bind themselves to accept the highest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to the Gas Manager, Mr. W. L. Donaldson.

W. Mullard,
Clerk.

Council Offices, Lymm,
Cheshire, June 30, 1909.

THE Prescot Gas Company invite TENDERS for the Supply of the following GAS-MAINS—namely:

7000 Yards of 4-inch.
800 Yards of 3-inch.
1300 Yards of 2-inch.

Full Particulars and Specification can be had on Applying to the undersigned.

Tenders to be sent in on or before the 13th of July inst.

John E. Hall,
Engineer and Manager.

Gas-Works, Prescot,
June 29, 1909.

TENDERS FOR COAL.

THE Directors of the Malton Gas Com-pany invite TENDERS for a Supply of BEST GAS NUTS, to be delivered at the Coal Depôt of the North Eastern Railway Company, Malton, in the Twelve Months ending June 30, 1910. Quantity, 4000 to 5000 Tons.

Forms of Tender and Particulars may be obtained from the undersigned.

Tenders to be sent in on or before Monday, the 12th of July inst.

The lowest or any Tender not necessarily accepted.

Henry Tobey,
Secretary.

Gas Office, Malton.

CITY AND COUNTY BOROUGH OF BELFAST.

THE Gas Committee of the Corporation invite TENDERS for the Supply of 105,000 Tons of Best Screened GAS COAL, to be delivered free, and trimmed, in Barges at Belfast Harbour, between the 1st of October, 1909, and the 30th of September 1910.

No Tender for less than 10,000 Tons will be considered.

Monthly Quantities and Particulars may be obtained from the undersigned.

Tenders, on Office Forms, endorsed "Tender for Coal," addressed to the Town Clerk, Belfast, will be received up till and including the 15th of July, 1909.

The lowest or any Tender not necessarily accepted.

Robert Sharpe,
Engineer and Manager.

Gas-Works, Belfast.

THE Gas Committee of the Coventry Corporation invite TENDERS for the Purchase of Surplus TAR produced at their Gas-Works for the Twelve Months commencing Aug. 1 next.

Estimated Quantity of Surplus Tar, 3500 Tons.

Form of Tender and Conditions of Contract may be obtained on Application to the undersigned.

The Committee do not bind themselves to accept the highest or any Tender.

Sealed Tenders, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, endorsed "Tender for Tar," must be delivered not later than Nine a.m., on Monday, the 19th inst.

Fletcher W. Stevenson,
Engineer and General Manager.

Gas-Works, Coventry,
July 1, 1909.

ASHFORD URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Council are prepared to receive TENDERS for the Supply of about

1800 Yards of 6-inch CAST-IRON MAIN.
2000 „ 4-inch „ „
750 „ 3-inch „ „

Full Particulars may be obtained from the undersigned.

Endorsed Tenders to be delivered not later than the 20th of July, 1909, to the Clerk to the Council, 11, Bank Street, Ashford.

The lowest or any Tender not necessarily accepted.

H. R. Turner,
Engineer and Manager.

Gas-Works, Ashford,
Kent, June, 1909.

TENDER FOR COAL.

THE Directors of the Pembroke Docks and Town Gas Company invite TENDERS for the Supply of 3000 Tons of Best Screened GAS COALS or NUTS for the Year ending Aug. 31, 1910, to be delivered at the Great Western Railway Jetty, Hobbs Point, Milford Haven. Steamboats of 400 to 500 Tons burden can be discharged at this pier in from Two to Three Days.

Sealed Tenders, endorsed "Tender for Coal," to be addressed to the Secretary, 4a, Lion Street, Brecon, on or before July 15, 1909.

Further Particulars can be obtained from the undersigned.

A. Horace Brookman,
Manager.

Gas Offices, Pembroke Dock,
June 21, 1909.

STRETFORD GAS COMPANY.

THE Directors of the Stretford Gas Company invite TENDERS for the Supply of Unscreened GAS COALS, NUTS, SLACK, and CANNEL, to be delivered at the Gas-Works, Stretford, on the Bridgewater Canal, or at Stretford Station (M. S. J. & A. Railway) during the next One, Two, or Three Years, in monthly Quantities as may be required, commencing Aug. 1, 1909.

The Tenders must state:

Price per Ton in Waggons at Pit.
Railway or Canal Rate to Stretford.
Waggon or Boat Hire to Stretford.

Tenders to be delivered to the Gas-Works, Stretford, not later than noon on Saturday, the 10th of July, 1909, endorsed "Tender for Coal, &c.," and addressed to the Chairman of the Company.

The Directors do not bind themselves to accept the lowest or any Tender.

Forms of Tender can be obtained on Application to the undersigned.

By order of the Board,
Benjamin Haynes,
Secretary.

Stretford, June 19, 1909.

STRATFORD-UPON-AVON CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of 6000 Tons of Good Screened GAS COAL or NUTS, for delivery during the Twelve Months ending Sept. 30, 1910.

Forms of Tender and other Particulars can be obtained upon Application to the Engineer and Manager.

Tenders to be sent in (and will be accepted only on the Forms supplied) not later than Aug. 21, 1909.

The lowest or any Tender not necessarily accepted.

J. S. CRANMER,
Engineer and Manager.

July, 1909.

GOOLE URBAN DISTRICT COUNCIL.

TENDERS are invited for the Supply of about 8000 Tons of GAS COAL and 700 Tons of STEAM COAL.

Particulars and Form of Tender may be obtained on Application to the Undersigned.

Tenders, endorsed "Tender for Coal," and addressed to the Chairman, Gas and Water Committee, Gas-Works, Goole, to be delivered not later than the 21st day of July, 1909.

W. A. BURTON,
Engineer and Manager.

Gas-Works, Goole,
June 30, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

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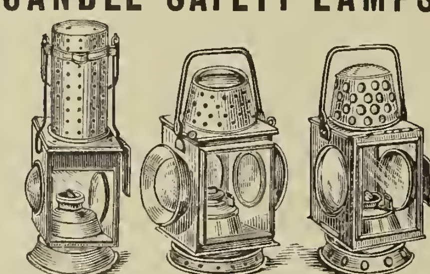

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LONDON: 16, Park Village East, N.W.

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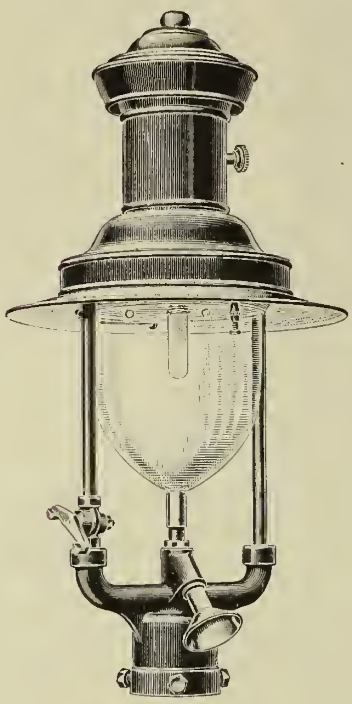

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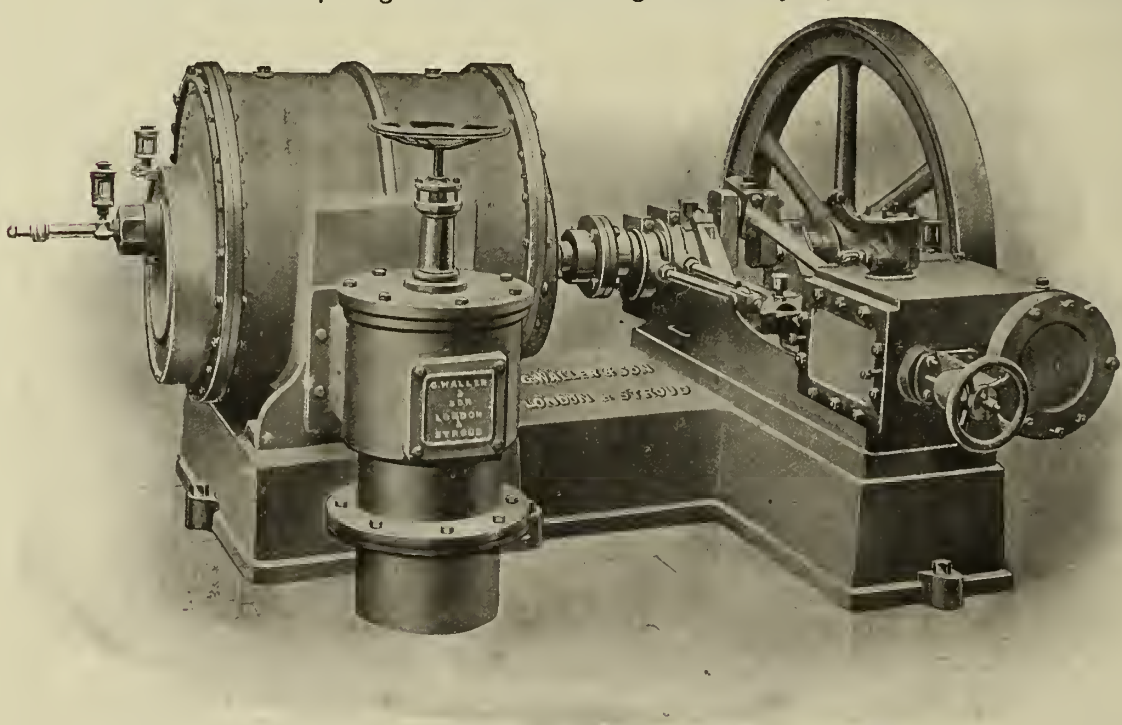
THE JOURNAL OF GAS LIGHTING WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CVII. No. 2409.] LONDON, JULY 13, 1909. [61ST YEAR. PRICE 6d.



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CONTENTS.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVII., No. 2409.——TUESDAY, JULY 13, 1909.

EDITORIAL NOTES—GAS, &c.

Stand-by Supplies to Producer Gas and Electricity Consumers—Another Success.

ONE of the most powerful arguments yet advanced before any Parliamentary Committee in favour of the right to make a charge for the convenience and insurance provided by a stand-by supply from the town gas mains where there is a private power-gas installation, or where electricity is taken from the town cables, or is furnished by a private plant, is to be found in our report of the proceedings on the Heywood Corporation Bill before the Local Legislation Committee, and particularly in the diagrams and tables (which we have reproduced) prepared, to accentuate the claim and the right, by Mr. Walter Whatmough, the Corporation Gas Engineer. The arguments of Mr. Keen, and the evidence of Mr. E. H. Stevenson and also of Mr. Whatmough, as presented to the Committee, are irrefutable. There is not the slightest reason why gas suppliers should be deprived of the protection willingly afforded in similar case by Parliament to electricity suppliers; and, from the point of view of equity, there is no reason whatever in the ordinary and constant consumers of gas being made the victims of the capital and extra working expenses involved in providing and giving the convenience and insurance of a stand-by supply, which may produce demands fluctuating between (if this may be called a demand for present purpose) *nil* over long spans of time and hundreds of thousands of cubic feet over quite a short period.

In one instance quoted by Mr. Whatmough of a stand-by supply to a consumer with a private gas installation, the "consumption" of town gas in seven years out of the past fourteen was *nil;* and in the other seven years, the consumption fluctuated between 1600 cubic feet in a year and 184,100 cubic feet, of which latter quantity 107,000 cubic feet were consumed in two months. In another instance, the quarterly consumption varied from 800 to 139,600 cubic feet. If this sort of thing goes on in districts where mills and factories are numerous and large, it will, without there is some form of compensation to the gas undertaking, assume serious shape for the ordinary continuous consumers, whose supply might also be jeopardized by synchronous breakdowns causing large sudden drafts on the gas-mains. Two cases illustrating the irregularity of demand where gas is used as a stand-by to electricity are also quoted in our "Parliamentary Intelligence"—the annual demands vacillating between a few thousands and 312,000 and 313,000 cubic feet in a year. In 1905, the year of the 312,000 cubic feet demand of the one consumer, the large proportion of 270,000 cubic feet was taken in three months; and in 1904, when the other consumer used the 313,000 cubic feet, 220,000 cubic feet of this volume were also demanded in three months. These sudden and heavy accessions of demand on the gas-mains were due to precipitate breakdowns of private electricity plants. In these instances, the available gas supply must have meant much to the owners of, and the people employed in, the industrial establishments, through preventing stoppage and the disorganization of business. The case, however examined, is complete for some recompense to the gas suppliers for the convenience, the protection, and the standing provision made, which averted so much loss. Besides such supplies producing at times no return on the capital outlay, and paying nothing for inspection and other disbursement necessitated by the connection, erratic demands are far less profitable than constant ones, more especially when the former are at power rates.

The fight has been long to get for town gas in this matter the same justice that electricity has for several years been accorded. But this session the parliamentary authorities seem to have at last awakened to the fact that gas suppliers have a right to justice just as much as other people. In the Mountain Ash Bill, a stand-by clause relating to private gas supplies has been allowed. But Heywood has gone one better, and has secured from the Local Legislation Committee stand-by clauses in relation to both private gas plants and electricity supplies, whether the latter is furnished by independent plants or by the Corporation cables. A variation, however, has been made in the clauses from those hitherto obtaining in the case of electricity supply, and in the Mountain Ash Bill. The stand-by charge has been limited to a maximum sum, and the line is fixed below which a charge is not to be made. In the case of consumers with private gas plants, the Gas Department are given the right to a standing charge, in addition to the account for the town gas actually used, not exceeding £5 a year. In determining the exact standing sum to be paid, regard is to be had to the probable maximum demand; but the Corporation are not to be entitled to a standing charge in respect of premises for which the whole supply of gas is taken through a meter having a nominal capacity of less than ten lights. The clause referring to a stand-by gas supply to electricity consumers is the same, except in respect of the last provision. This is varied so that, if the supply of gas is taken through a meter of less nominal capacity than ten lights, there is to be no charge if the supply of electricity is obtained from the Corporation cables; but if the electricity is furnished by a private plant, the standing charge that the Gas Department may collect is not to exceed 5s. a quarter. We fail to see why this condition should not have been applied to stand-by supplies with meters of a less nominal capacity than ten lights where the supply of gas is usually obtained from a private plant. That, however, is a comparatively small detail. The Heywood Corporation have achieved notable success in this matter, though the maximum standing charge of £5 a year may be considered insufficient by some gas suppliers. There is no general desire in the gas industry to be vindictive or ungenerous in this matter; all that is asked is a fair recognition of protective service, and of the expense involved in rendering that service.

Unremunerative Slot Supplies.

THE authorities of the two Houses of Parliament have come to a decision on the question that has been raised rather frequently in recent sessions, as to what should be done in the matter of indemnifying gas suppliers against loss in respect of their expenditure on prepayment meter supplies, in cases where, through the householder using little or no gas, a sufficient sum is not paid to cover capital charges. The promoters of Gas Bills have tried to meet the matter by asking that, where payments do not provide an amount equal to a rate of 10 per cent. on the cost of the meter, they may be empowered, if they think fit, to make a minimum charge not exceeding that amount. Our own view is that, taking the prepayment business as a whole, the aggregate of the excess payments does, as a rule, produce sufficient to meet the capital expenditure. But at the same time, we cannot dispute the unfairness of one slot consumer contributing towards the share of the capital expenses of another consumer. However, the method of recoupment proposed by gas suppliers, as mentioned above, does not commend itself to the parliamentary authorities, inasmuch as it infringes the very principle of prepayment by giving the suppliers power to collect something additional subsequent to the service rendered. The Lord Chairman and the Local Legislation Committee, however, have now accepted the principle of a minimum charge to prevent loss. But they favour the clause that was inserted in the Swinton and Mexborough Gas Bill last session, and has been introduced into the Mountain Ash, Prestatyn, and Heywood Bills this session,

with a slight amendment. The effect of the clause is that the gas suppliers who obtain the power may, if they think proper, require, for the purpose of assuring the capital charge, a deposit of 1s. per quarter for a prepayment meter. If the deposit is not drawn upon (the consumption being sufficient), the shilling can be carried forward as the deposit for the ensuing quarter, and so on from quarter to quarter. If it has to be drawn upon in any quarter, then (as we understand the position) the consumer will make up the deposit to the shilling for the ensuing quarter. That is the gist of the provision that has met favour in the eyes of the parliamentary authorities to meet a state of things that some gas suppliers are of opinion requires dealing with. However, as few complications as possible is a desirable condition in connection with prepayment services. It must be remembered that the poorest of the consumers are those whose payments are the most likely to be deficient of the sum required for the capital charges; and these are the ones who will be most disposed to think, through not appreciating the position, that they are being in some way "done" by the gas suppliers when asked to reinstate the deposit on it being drawn upon.

Gas Charges Temporarily Governed by Coal Prices.

The Alliance and Dublin Consumers' Gas Company's Bill has been finally dealt with in the Committee stages; and again lower illuminating power gas and modern methods of testing have succeeded in displacing notions and method that apply to other days. What is more, this was all done by agreement between the representatives of the Corporation and the Company, without the evidence for the opponents being heard, and without asking for anything more from the Committee than their endorsement of the terms. When the Corporation of Dublin recognize that it is no use to longer "kick against the pricks" in this matter, it may be expected that other local authorities of a less militant disposition will easily be persuaded against adopting such a fatuous course. But in this case we cannot imagine why the spirit of compromise should have been more dominant in the corridors of the Committee rooms of Parliament at Westminster than in the Council House and the Board-Room at Dublin. Perhaps when at home there is a certain dignity that prevents one side or the other making a definite move towards a peaceful solution of differences. Or perhaps when at home one side was unreasonable; and not until the parties were on the neutral ground of the parliamentary corridors at Westminster did a *rapprochement* properly set in. We may hazard an opinion as to which side was most inflexible. The opposition were badly beaten in the Lords. It was the Company who had the right of concession on their side; and it would have been to their advantage, if a reasonable attitude had been earlier adopted by the Corporation, to have conceded up to a point rather than have had a repetition of the expensive fighting at Westminster. As it is, the Corporation may feel highly gratified at the success of their negotiations outside the Committee room while the proceedings were going forward within. In our opinion, they gained far more by agreement (the terms of which will be seen elsewhere) than would have been secured had the matter been finally submitted to determination by the Committee.

There is one matter that is particularly noteworthy about these Dublin proceedings last week; and it is the settlement arrived at with regard to the price of gas in conjunction with the reduction of the illuminating power. There were special circumstances here, in that the former illuminating power was a high one tested by the flat-flame burner; it was desired to reduce it to 14 candles tested by the "Metropolitan" No. 2 burner. The standard price was also fairly high; and the full dividend under the sliding-scale has never been paid. It was agreed to lower the standard to 3s. 7d. This may, or may not, be reasonable under the circumstances of Dublin. It is unnecessary to say; but, as a general rule, where the standard price is a fair one, and the shareholders would be adversely affected by any interference with it, any variation should be strenuously resisted. Parliament has recognized that, as a rule, there is no necessity to meddle with the standard; and generally in recent sessions there has been no such disturbance on the reduction of illuminating power—in view of the fact that the sliding-scale is a sufficient palladium for the consumers. But in the Dublin settlement the novelty—merely temporary and supplemental to what will appear in the Act—is an agreement to reduce to 3s. 4d. the actual price charged to the consumers for three years from Jan. 1 next; and for every 1s. that the average price paid for coal exceeds 13s. 6d. per ton c.i.f., the price of gas may go up by 1d., and, for every 1s. that the price paid for coal falls below 13s. 6d., the price of gas is to recede by 1d. This idea, we believe, emanated from Mr. Isaac Carr. There is no doubt about it that it does ensure for a period that the consumers shall realize some monetary advantage from the reduction of illuminating power. But we do not think they will actually derive any more from this than they would have done under the ordinary operation of the sliding-scale. To our mind, it is much better for gas consumers that the siding-scale, and the management of a business working under the sliding-scale, should be free from all encumbrances of the kind. However, the imposition of such conditions does not indicate the existence of any superfluous confidence between the Corporation of Dublin and the Gas Company.

Exemption from the New Land Taxes.

In a comment on the Finance Bill in the "Journal" for the 8th ult., it was briefly shown how the new land taxes threatened to affect statutory gas undertakings. In view of the statutory restrictions under which such undertakings are conducted (which restrictions are framed with regard to the interests of the various bodies concerned and the public in particular), such taxes as those proposed would have, in a degree, unfairly introduced an element of disturbance into the conditions obtaining at the time the statutory lines of procedure for the undertakings were defined, and would have added an additional drag on the public service rendered by such concerns. As a matter of fact, all the increments—and they have been many of late years—of financial burden produce a variance, without any compensation, of the conditions on which, in regard to statutory concerns, the Special Act of Parliament or Provisional Order directs that the business shall be conducted, and so affect the respective statutory privileges of the interests involved. It needs no argument to show anyone of ordinary intelligence that this is true. But, fortunately, in respect of the new land taxes incorporated in the Finance Bill, there is to be exemption for statutory companies working under Special Act or Provisional Order. The pledge has been given by the Chancellor of the Exchequer. Nothing, however, is said about municipal trading undertakings which are also statutory concerns; and no hint is given as to any release from the new obligations of companies that perform without statutory authority similar services for the public.

According to pledge, and the text of a new clause to be inserted in the Bill, neither increment value duty, reversion duty, nor undeveloped land duty is to be charged in respect of any land while it is held by a statutory company for the purposes of their undertaking, and cannot be appropriated by the company except to those purposes. On the other hand, nothing in the provision is to prevent the collection of increment value duty when the land is sold or ceases to be held. Another important concession is the exemption from duty of any mineral rights in respect of minerals the working of which would be likely to damage works forming part of the undertaking of a statutory company, while the company are owners of the minerals, or while the owners of the minerals are restricted from working them by any covenant or other obligation entered into with the company. Returns as to the value of land held by statutory companies will not be required—that is to say, land exempt from duty—except in respect of original site value when needed by the Commissioners, in which case the actual cost to the company for the purchase of the land will be substituted for the total value and site value. Furthermore, for the purposes of the Lands Clauses Acts, as incorporated with any Special Act, the amount (if any) payable by the transferor as increment value duty is not to be treated as part of the costs or expenses of the conveyance of the land, and is not to be taken into account when assessing the compensation to be paid to the transferor.

For such exemptions, statutory companies—including both gas and water companies—may be truly thankful. It is difficult enough in these times in the gas industry to make the savings on working produced by technical advances keep pace with the greater expense imposed by external causes. In consequence, there is ever a struggle going on in resisting the effects of the uncontrollable burdens that weigh heavily on the endeavours to afford the best possible public service.

Another Co-Partnership Company.

We are pleased to be able to announce that another Gas Company is about to be added to the list of undertakings in connection with which the beneficent system of profit-sharing is in operation. This latest convert is the Enfield Gas Company; and we heartily congratulate both those who are responsible for the administration of this go-ahead concern and those who are fortunate enough to fill the position of employees, upon the decision to adopt a plan which has been found elsewhere to work so admirably for all parties concerned. Of course, the very fact that the Directors have taken such a step is an indication that the Company is a progressive one; but if further proof be needed, it can be secured by the merest glance at the figures for the past few years. The quantity of gas sold in 1899 was 91,223,000 cubic feet; and last year it was 197,132,000 feet. The number of consumers on Dec. 31 last was 9001, of which no less than 6763 have prepayment meters. The number of cookers installed at the same date was 6515. The consolidated ordinary stock is entitled to 5 per cent. with a selling price of 4s. 6d. per 1000 feet. As from last April, the charge was reduced from 3s. 5d. to 3s. 3d. per 1000 feet; the sliding-scale dividend corresponding to which would be £6 17s. 6d. per cent. per annum, if the net profits admitted of its payment. As a matter of fact, dividends paid for the five-and-a-half years to December last have been at the rate of 5½ per cent. per annum—with a carry forward of undivided profit which has increased from £2426 in 1903 to £11,169 in 1908. The Company is thus already in an excellent position, which will without doubt be still further improved as a result of the new move now recorded.

A Resuscitated Company.

From Scotland, from the North, South, East, and West of England, correspondents (and we are obliged to them) have forwarded copies of the prospectus of the Patent Block Tar, Motor Oil, and Asphalte Company, Limited, which is the old Tar (Patents) Solidifying and Distilling Company, Limited, revived. The original Company was floated in 1907; and it did not "take on"—only some 490 preference and 269 ordinary shares being allotted as the result of the public offer of 2993 preference and 5000 ordinary shares. The public showed its good sense. In addition, 2000 ordinary shares were allotted as fully paid to the vendors (the vendors being that centre of activity the Water-Works, Lighting, and Power Investment Corporation, Limited, of No. 99, Cannon Street); but the shares only represented payment "on account" of rights, licences, and plant. The Directors of the new Company are now essaying to issue the balance of the share capital of £10,000—that is to say, 4731 ordinary shares and 2503 of the 6 per cent. preference shares—and are doing so primarily for the purpose of paying the 99, Cannon Street promoters the cash due to them under their contracts (which appear to total to a few thousand pounds), and, secondarily, for the purpose of obtaining working capital and cash for preliminary expenses. When 99, Cannon Street and the preliminary expenses (which we suppose include the previous abortive appeal for the capital) are satisfied, we look with misgiving upon the adequacy of the amount of the working capital. An account of the process forming the foundation of the Company's operations was published in the "Journal" for Feb. 26, 1907, about which time the original Company was launched, with offices in the City, and Allan Maclean, C. F. Gordon Dill, and H. W. L. Way, J.P., as Directors.

Men, Objects, and Promises.

The scene of the exploiting of the Company with the more pretentious title is Newport, Mon.; and the Directors are Sir C. B. H. Soame (Bart.), H. W. L. Way, J.P., W. R. White, M.D., S. J. Acland, "M.I.G.E.," and John Maclean. One of our correspondents facetiously writes at the side of the names of these men: "I think you have heard of these gentlemen before." Perfectly true. There is not one of them who has not been more or less identified with 99, Cannon Street promotions. The only member of the original Board on the new one is H. W. L. Way. The objects of the Company are first, to (as we have shown) provide the Investment Corporation with money; secondly, to erect works for solidifying tar; thirdly, to provide plant for the manufacture of briquette fuel from solid tar, with steam, house, and anthracite small coal; and, fourthly, to (we are authoritatively told) bring the matter prominently before gas companies, corporations, and manufacturers, "who, by adopting the patented process under the payment of a small royalty, will be enabled to solidify their tar, and sell same direct to patent fuel manufacturers to take the place of pitch, and thereby secure a much higher price than is at present obtained for liquid tar." The solidifying process may be all right; but we may as well speak frankly in this matter. Gas undertakings are not likely to look at the process under present auspices and circumstances, nor will the public subscribe the money required, though there is a Bart., a J.P., an M.D., an "M.I.G.E.," and (are we right?) a retired ship's commander on the directorate. Of course, according to the prophecy in the prospectus, there is to be a golden harvest for those who confide their money to the owners of these titular distinctions and qualifications. We are among those who do not believe it; and our advice is to look elsewhere for the investment of surplus cash.

Gas Capital for Bucks and Oxon.

The Bucks and Oxon District Gas and Coke Company, Limited, cannot promptly get all the money they require; and they are again begging the public, through A. H. Franklin, Solicitor, Oxford, to subscribe, at £97 10s. per cent., £2000 first mortgage debentures, carrying interest at the rate of 5 per cent. per annum, with a half-year's payment promised as early as Sept. 29 next. The Bucks and Oxon people have been forward with these appeals too frequently of late to inspire confidence in the public mind. We observe that the same legal gentleman of Oxford also signs advertisements for applications for the purchase of £1200 first mortgage debentures of the Mid-Oxfordshire Gaslight and Coke Company, which Company have a certain amount of parliamentary notoriety, but nothing else that is parliamentary. The debentures carry interest at 5 per cent. per annum, payable at the (we were nearly writing in error "Bank of England") Metropolitan Bank (of England and Wales), Limited. It is interesting to notice in the suggested application form at the foot of the advertisement that the applicant kindly binds himself to "accept the above amount, or such amount as you allot me." That is giving large liberty to the Directors; or perhaps the Solicitor of Oxford has unintentionally omitted the word "less" between "such" and "amount," or is the printer the party responsible for the omission?

Some More Municipal Gas-Works Results.

Since reference was last made in these columns, about a month ago, to the results attained during the last financial year by gas undertakings in the hands of local authorities, numerous further statistics have come to hand for publication in our news columns. The features naturally vary in different cases; but generally speaking the situation is summed up in the words, "Satisfactory results, in spite of the restricting influence of trade depression." There is a net profit at Burslem of some £2300. The gas made per ton of coal is 12,036 cubic feet. At Coventry, £2000 of the net surplus of £3250 is being devoted to the relief of the rates. The reduction of profits on the present occasion is accounted for under three heads—a decreased consumption by the large manufacturers, owing to slackness in trade; an appreciable decline in the receipts from the sale of residuals; and increased capital charges arising from the additional expenditure that has been incurred. The balance carried to profit and loss account at Darlington is £12,445; and of this there has been transferred to the district fund in aid of the rates £4500. The gross profit is equal to 6·69 per cent. upon the total capital employed. From Devonport there is reported an increased consumption of 1·6 per cent., and a gross profit equal to 7·5 per cent. on the present capital. The make of gas comes out at 10,248 cubic feet per ton. The quantity of gas unaccounted for is no more than 2·7 per cent., though even this small figure is a little more than was the case the previous year. The net profit of £1613 has been transferred to the reserve fund. The accounts of the Edinburgh and Leith Commissioners show a falling off of 57 million cubic feet in the quantity of gas sold; but, owing to a rise in the price, the receipts therefrom are £2840 more than was the case the previous year. Hereford is in the happy position of being able to record an increase in the quantity of gas sold of nearly 4½ million cubic feet, or 3·6 per cent.; and this is all the more satisfactory as it follows upon the heels of an increase of 3 million feet. The make of gas per ton of coal carbonized is 10,981 cubic feet, as compared with 10,560 feet the previous year; and

it is pointed out that, "if corrected to normal temperature and pressure, as is the general practice, the figure would be increased to 11,254 cubic feet per ton of coal."

There has been a total increase in the amount of gas sold at Leek of 1·81 per cent. The ordinary meter supplies, however, show a small decrease, which is no doubt correctly attributed to the serious depression of trade during the latter part of the year. It will be noted that the make of gas per ton of coal carbonized constitutes a record for the department—being 10,617 cubic feet, as compared with 10,486 feet in the previous year. The use of gas at Longton has been affected by depression in trade and mild weather during the winter months, as well as by the substitution of electricity for gas for street lighting. The quantity of gas sold exhibits a drop of 1·6 per cent. when compared with the previous year; but owing to a reduction in the leakage account, there is a falling off of 2·2 per cent. in the gas made. The quantity unaccounted for, at 4·01 per cent., is the lowest recorded in the history of the undertaking. This reduction, too, has been accompanied by a substantial increase in the production of gas per ton of coal, which has reached the very high figure of 12,507 cubic feet. The price charged for gas was substantially reduced during the twelve months; while the rates have also received a good round contribution. The quantity of gas supplied to the street-lamps and municipal buildings at Oldham free of cost last year was close upon 83 million cubic feet. The gas manufactured shows a decrease of 2·5 per cent.; but all this, and more, was due to lessened consumption in mills and workshops, owing to the cotton-spinning dispute and bad trade generally. The consumption in private houses and shops exhibits a satisfactory increase. The average quantity of coal gas made per ton of coal carbonized is given as 11,717 cubic feet, compared with 11,539 cubic feet in the previous year; while the loss of gas from leakage, &c., has been reduced from 5·12 per cent. to 4·83 per cent.

Ossett has experienced a slight decrease in the amount of gas sold. The make per ton of coal is stated at 10,910 cubic feet—a little more than in the preceding year; and in view of all the circumstances, the small falling off in sales will be regarded with equanimity, especially considering the fact that it is the first time in the history of municipal control of the works that there has been a decrease in consumption. Even on this occasion, it is only the trade consumers that have taken less gas; that used by small customers showing a good increase. The price of gas has been reduced; and it is worthy of note that the opinion seems to prevail at Ossett that "cheaper gas" is a better aim than to make profits for the relief of the rates. A small increase in the sale of gas at Stourbridge is naturally considered satisfactory, in view of the fact that the general trade of the district has not been good. Out of a surplus of £2200, it has been decided to transfer £1750 to the relief of the rates. The make of gas per ton of coal carbonized works out at 10,909 cubic feet. The depression in trade during the year has resulted in a reduction in the consumption of gas at Tipton representing a decline in revenue of over £1000 compared with the receipts the previous year; while a further loss of £400 has been sustained by a reduction of 3d. per 1000 cubic feet in the charge for gas for lighting purposes. The cotton strike adversely affected the private gas consumption at Tyldesley-with-Shakerley; but the undertaking, we learn, has not suffered so much as those of some towns in the district. The gross profit is at the rate of 11·14 per cent. on the capital employed. Damage to mains by subsidences has been responsible for an increase in the unaccounted-for gas to 8·4 per cent. Some decrease in the quantity of gas sold is reported from Workington; but the amount of gas produced per ton of coal carbonized increased from 10,755 to 11,100 cubic feet, and that sold from 9990 to 10,580 cubic feet. It is, with justice, considered by the Manager, "exceedingly gratifying that the distressful period through which the town passed did not leave any mark on the finances of the Gas Department."

Successful Gas and Electricity Supply at Longton.

The remarks of the Vice-Chairman of the Gas and Electricity Committee of the Longton Corporation (Mr. W. Hulse), when moving the adoption of the Committee's minutes at a recent meeting of the Town Council, as given in the "Journal" last week, are fully borne out by the report and accounts for the past financial year, some particulars from which are given in another column. Though there was a drop of nearly 3½ million cubic feet in the consumption of gas, owing to slackness of trade and the substitution of electricity for lighting the streets, and the revenue was £2644 less, consequent on a reduction of 5d. per 1000 cubic feet in the price of gas and the low market value of all the residuals, there were other features which justified Mr. Hulse in characterizing the past year as the most successful one the Corporation have had. In the first place, the prepayment system had, he said, become a paying concern; the consumption of gas having increased by 2¼ million cubic feet. Then there was a substantial increase in the quantity of gas produced per ton of coal carbonized—the make reaching the high figure of 12,507 cubic feet; and the unaccounted-for gas was brought down to praccally only 4 per cent. When it is mentioned that at the time the Corporation took possession the leakage was 13·28 per cent., and that of late years it has been 8·5 per cent., the present figure is a very satisfactory one, especially considering that the whole distributing system is affected by mining operations. The high make and the low leakage are two matters on which the Engineer and General Manager (Mr. W. Langford) may be heartily congratulated. The accounts show how very largely the revenue of the gas undertaking has contributed to the capital, and to what extent the rates have been relieved during his tenure of office. After meeting all liabilities, the current year commences with a balance of £388. The Electricity Department also had a successful year; there being an increase of 35·6 per cent. in the units generated. All renewals were paid for out of revenue; there was an increase in the quantity of current used; and the result of the year's trading was a net profit of £101. The Committee's policy has been to supply current only when and where there has been a public demand for it. The usual practice of canvassing gas consumers to adopt electricity, involving the laying of new mains and services, has not been followed; neither have the Committee reduced the price of current for motive power to an impossible figure in order to favour motors to the exclusion of gas-engines. In short, they have striven to conduct the dual undertaking on business lines; and the gradual growth and prosperity of both departments is the result. The accounts show a prosperous year's working; and the Council have expressed their entire satisfaction with it. Indeed, they could hardly do otherwise. As Mr. Hulse remarked, when the time comes for handing over the concern to the governing body of the federated district, Longton will place in their hands a grand asset; for it is in a better condition financially and in every other way than it has been since it has been a Corporation undertaking. That it is so is admittedly due in large measure to the ability displayed by its General Manager.

Reduction in Price or Rate Relief.

The idea of utilizing profits made out of the trading undertakings for the relief of the rates of the district, is one that always has possessed—and it is to be feared in some quarters always will—a large amount of attraction, principally perhaps for those connected with municipal work. A large surplus both looks well and sounds well; and then by its simple transference to another account, the extent of the direct rating may be diminished, which also has a desirable air about it. There is, however, still another aspect of the matter—and one which, in the opinion of many of those who have carefully studied the question, has in its favour a greater measure of fairness. It is that the customers who make the profits (and who would, by increased charges, be called upon to refund any losses) should enjoy the full benefit of those profits. At Teignmouth, as in a number of other places, opinion is divided on the subject; and a proposal of the Gas Committee to further reduce the price of gas has twice been referred back to them by the Urban District Council for further consideration. On the second occasion, this result was arrived at in spite of the fact that the Council had before them a convincing report by the Gas Manager (Mr. J. A. Gray), which concluded with the suggestion that, in the interest of the department, the gas consumers should be the Council's first and final consideration. The policy of reducing the price has in recent years been actively carried out at Teignmouth; and in the past financial year, with gas at the lowest rate, the gross profit was the highest recorded.

There seems good ground for Mr. Gray's opinion that the financial position of the department would be much worse to-day if the gas prices of the past still prevailed, and that so long as there are non-consumers in the area of supply there are business reasons for price reductions; while no one can disagree with his remark that "the question of low price becomes much more important in relation to the uses of gas for cooking, heating, and motive power, for which purposes there is still a large field to exploit." The wisdom, from the point of view of the welfare of the undertaking itself, of reducing the price of gas as far as possible cannot be challenged. The output must be increased thereby, and thus the business be placed on a stronger foundation; while, as has already been proved at Teignmouth, the effect is favourable from a profit-earning point of view. But then, of course, there are the "claims of the ratepayers" to be considered. Shall the price of gas be kept up, in order to relieve the rates? What these "claims" are, and how surplus profits that may accrue to the undertaking, with a low price for gas, should be utilized, are so admirably set forth by Mr. Gray, that we cannot do better than quote his own words: "That surplus gas profits should be used to maintain the gas plant before being devoted to any other purpose, surely admits of but one opinion; and the creation of a fund to obviate the necessity of taking up any further loans for gas purposes, and to defray the cost of all extraordinary gas departmental expenditures, is a matter which merits serious consideration. Such a fund would tend to the gradual total extinction of the capital debt on the gas-works—thus allowing for the production and sale of gas being conducted on the most economical lines, and to the best advantage of the gas-consuming ratepayers, from whom the revenue is derived. Under these conditions, in all probability there would soon be very few non-gas consuming ratepayers; and the individual advantage would be proportionate to the gas consumption—the Gas Department being of the greatest service to to those most valuable to itself. So long as the consumption is maintained, the responsibility for the gas-works of the ratepayers in that capacity is quite negligible."

Devonport Gas Committee and Messrs. Willey and Co.

Everyone who has had any part in the history of the Devonport municipal gas undertaking must heartily re-echo the wish expressed at the meeting of the Corporation last Thursday, that the gas controversy may now be buried for ever. Its latest phase has ended in a highly satisfactory manner for the town. Messrs. Willey and Co. have acted generously by the Corporation, and, while no doubt guided by proper business-like considerations, have contributed in a handsome manner to the settlement of a dispute which was attended by no little difficulty. Under the new agreement, the Corporation are gainers all round. The price for the supply of automatic installations is substantially reduced, while the charge for the maintenance of installations fixed after July 26, 1908, is not to be made. Under the original agreement, dated July 26, 1903, Messrs. Willey were for ten years entitled to not only charge the prices from which they now agree to reductions of from 10 to 20 per cent., but to receive an allowance of 1s. 2d. per quarter, from the end of the first period of five years, for the maintenance of every installation fixed or to be fixed under the contract. Mr. J. W. Buckley, the late Gas Engineer, reporting last December on the effect of the agreement to the Gas Committee, submitted a calculation according to which the clause respecting maintenance involved a liability to the Corporation of £14,000, or about double the amount for which the Gas Committee themselves could do the work. It would, therefore, seem to be a very moderate estimate which places the gain to the Corporation under the new agreement at £6000—the figure mentioned by one of the speakers at last week's meeting. The great fall in prices since the original agreement was made no doubt partly explains the willingness of Messrs. Willey to concede substantial reductions under the new contract; while they, of course, have been desirous of maintaining good relations with an undertaking with which they have had business connections for many years. In this respect, their accommodating spirit seems likely to produce the desired effect.

The Favoured Lamps.

The report of the Sub-Committee of the Streets Committee of the City Corporation who recently visited the Continent to inspect the public lighting arrangements is in the press, and it is anticipated will be almost immediately circulated. It is believed that it will be rather a comprehensive document; and that its contents will be well worth study. The "City Press" is usually well informed on City municipal affairs; and it is understood by our contemporary that the Sub-Committee state clearly and explicitly in their report that the lighting of the City is capable of great improvement, and that in many respects the arrangements adopted abroad are far superior to those which rule with us. In particular, it is urged that there is no uniformity of lighting in the City, and that the advantages of some of the schemes in operation are very considerably minimized through faulty placement. The Sub-Committee's idea is that incandescent gas-lamps should be adopted, with inverted burners, and that the lamps should be so hung overhead as to enable the cleaning to be undertaken without interfering with the street traffic. It is also proposed that, in accordance with the system in vogue on the Continent, the lamps should be lighted and extinguished automatically.

More Strife.

The relief with which the coal trade generally learnt of the settlement of the South Wales dispute some days ago, has been short lived; for there has since been a continuous manifestation of dissatisfaction and disagreement in other fields. No newspaper has it been possible to take up without being confronted with the "Coal Crisis in Scotland" and the "Miners' Agitation in Staffordshire and Yorkshire." Though the latter has already reached the strike stage at some pits, the Scotch question is no doubt the more serious one—not so much because of immediate likelihood of trouble, as on account of future possibilities. Notices have been served by the masters, intimating a reduction of wages as from the end of this month. They are acting in concert; and their contention is that the extra expense involved by the notorious Eight-Hours Act renders such a step imperative. The men, on the other hand, loudly proclaim their firm determination not to accept less than the present 6s. per day, which they claim is the minimum rate under the agreement entered into between the parties in 1888. In the event of a strike against the reduction being decided upon, there is at least a possibility of the men putting into execution a threat to call upon the Miners' Federation of Great Britain to take a ballot of the English and Welsh members on the question whether they will also come out in support of their Scotch brethren. It is this aspect of the matter that gives a gravity to the dispute which it otherwise would not possess. If the Scotch miners alone went on strike, it would be a bad business locally; but the industries of the country would no doubt jog along all right until the combatants came to terms. But the "national strike," which has already been heard of in connection with the South Wales trouble, would be an altogether different matter. There is, however, no reason why the good example of settlement set by Wales should not be promptly followed by Scotland; and there is plenty of time for such a result to be brought about. The differences to be bridged over do not seem to be any greater in the latter case than they were in the former.

The Late Dr. G. F. Deacon.—At the last meeting of the Water-Works Committee of the Liverpool Corporation, the Chairman (Alderman Burgess) referred to the recent death of Dr. G. F. Deacon, who had been so many years associated with the water supply of the city, and expressed the hope that there would be put up some permanent memorial of what he had done for Liverpool, and particularly of his connection with the Vyrnwy Water-Works. He subsequently moved—"That this Committee has learned with deep regret of the death of Mr. George Frederick Deacon, M.Inst.C.E., LL.D., and records its deep sense of his eminent services to the city, especially in the construction of the Vyrnwy Water-Works, and desires to convey to Mrs. Deacon and the members of her family its most profound sympathy with them in their bereavement." Alderman Radcliffe seconded the motion, and it was carried unanimously. At the meeting of the Birkenhead Town Council last Wednesday, the Chairman of the Water Committee (Alderman H. Bloor) referred to the loss the Corporation had sustained by the death of Dr. Deacon, and moved the following resolution: "That this Council, having heard with deep regret the announcement of the death of Mr. George Frederick Deacon, LL.D., C.E., of Westminster, desire to place on record their high appreciation of the very eminent services rendered to Birkenhead by Mr. Deacon as advisor during many years past on numerous important questions connected with the water supply of the town, and also the author of the scheme sanctioned by the Birkenhead Water Act, 1907, for the supply of water to Birkenhead from the Rivers Alwen and Brenig."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 131.)

Last week was not a good one on the Stock Exchange. Business was a great deal too quiet, and there was a lack of animation in markets generally—the sort of state of things in which it does not take much to topple prices dowu. It is not easy to assign reasons for this; easier indeed to find reasons (cheap money, for instance) why the tendency should have been the other way. The opening day was the best of the week, and gave fair promise. Business was pretty brisk, and prices in several lines were on the rise. Consols gained $\frac{3}{8}$; and other of the gilt-edged were good. Railways stood stiffer; and the Foreign Market was firm. But on Tuesday came signs of giving way. The best class remained steady; but in many other lines prices were inclined to slide down. Business fell very quiet on Wednesday. Again the best quality, headed by Consols, were the stronger; but the general condition was torpid. The falling tendency in prices was accentuated on Thursday; and it spread to Government securities. Coal troubles flattened Railways. On Friday, a little more activity was perceptible, but not much accretion of strength. Some of the best were lower, and Consols lost $\frac{3}{16}$. Saturday was a very quiet day, without any animation except in the more adventurous undertakings. Consols lost another $\frac{1}{16}$. In the Money Market, the supply was superabundant, and rates eased down considerably; but they steadied before the close. Business in the Gas Market was about up to the average of the last month or two, with a nice firm tendency, which showed itself in a considerable number of moderate advances in price. In Gaslight and Coke issues, the ordinary was unchanged and very steady at the old prices. Transactions were between 103 and 103$\frac{7}{8}$, with the best figures at the end of the week. The secured issues were irregular. The maximum was done at 88$\frac{1}{4}$ and 88$\frac{1}{2}$ (a rise of $\frac{1}{2}$), the preference at from 104$\frac{3}{4}$ to 105$\frac{3}{4}$ (a fall of 1), and the debenture at from 85 to 86 (a rise of $\frac{1}{2}$). In South Metropolitan there was rather more activity, and dealings realized from 122 to 123$\frac{1}{4}$. Commercials, too, were more active. The 4 per cent. made from 108$\frac{3}{4}$ to 110, the 3$\frac{1}{2}$ per cent. 104$\frac{1}{2}$ and 105$\frac{1}{2}$, and the debenture 81$\frac{1}{2}$. In the Suburban and Provincial group, some dormant issues woke up. Alliance and Dublin old changed hands at 17$\frac{5}{8}$ (a rise of $\frac{1}{4}$), ditto new at 12$\frac{7}{8}$, Bournemouth "B" at 15$\frac{5}{8}$, Brentford old at 257 (2 up), ditto new at 194$\frac{3}{4}$, Brighton "A" at 155, Portsea "C" at 119$\frac{1}{2}$, South Suburban at 120$\frac{1}{2}$, Tottenham debenture at 100 and 100$\frac{3}{4}$, aud West Ham at 121$\frac{1}{2}$ and 122. The Continental comcompanies were rather quieter. Imperial realized from 179 to 180$\frac{1}{2}$, ditto debenture 96, Union 96, ditto preference 138$\frac{1}{2}$, European fully-paid 24$\frac{3}{8}$ and 24$\frac{3}{4}$ (a rise of $\frac{1}{2}$), and Malta 4$\frac{15}{16}$. Among the undertakings of the remoter world, Buenos Ayres was done at from 13$\frac{13}{16}$ to 14$\frac{1}{16}$, Primitiva at from 6$\frac{3}{4}$ to 6$\frac{15}{16}$, ditto preference at 5$\frac{3}{8}$ and 5$\frac{1}{2}$, and River Plate at 14$\frac{7}{8}$ and 15.

ELECTRICITY SUPPLY MEMORANDA.

Lower Candle Unit Lamps for High Voltages—Capital Charges, Included or Excluded—Administration in Dublin and Elsewhere—Compulsory Patronage of the Canterbury Corporation Electricity Department.

The prediction at one time made that it would be impossible to produce metallic filament lamps of the lower candle powers for use on the higher voltages, is being negatived. The units of candle power of these lamps are descending; and as they are doing so, a little is being lost in efficiency in respect of wattage per candle power. It has been said for some time past by many electrical enthusiasts that lower candle high voltage metallic filament lamps are, for the good of the industry, a desideratum; but these enthusiasts are, as a rule, men without the responsibility resting upon them of an electricity station with only a lighting load. Those bearing such responsibility are not at all keen for low-priced lamps of the lower units for high voltages. They will, however, have perforce to order their ways to meet the condition that is slowly but surely coming, and which, unless prices for current are raised, will have the tendency to still further cause a dwindling of revenue. The Stearn Electric Lamp Company have introduced the "Leuconium" 16-candle lamp for 210 voltage. The filament of this lamp is in nine loops, and has a total length of 40 inches. The efficiency of the new lamp is said to be about 1·6 watts per British standard candle. Therefore something has been lost in this regard in getting to the lower candle power. There are hints that this unit of candle power is not the downward limit. It is believed in some quarters, however, that these lower candle power lamps will only have vogue in the minor positions where illumination is required—such as cellars, passages, lavatories, and so forth; the fancy of consumers being now for higher illumination, after the dull light of the carbon filament lamps. Even so, the consumption of the 16-candle carbon filament lamp is halved by the new comer; and so, used for inferior situations only, the lower consumption will certainly make an appreciable difference in the aggregate. The bulb is very similar to that of the carbon filament lamp. Upon this point, the "Electrician" makes the remark: "This results in the filaments being to some extent screened from view when the lamps replace those with carbon filaments, for which type the majority of shades now in use have been designed. Where attention is not paid to this point, *the effect on the eye may be harmful.*" There is more to be learned about these lamps yet—particularly as to their lasting power. However, at 5s. per 16-candle power lamp, it is not at all likely there will be a mad rush for the new lamps. Anyway, the "Electrical Review," always breaking the tenth commandment by coveting more and more of the business of the gas industry, thinks the new lamp will prove a most valuable weapon to suppliers in competition with gas lighting.

A spring clean is responsible for depriving the world of some interesting information that it was hoped would be forthcoming at the resumed inquiry into the application of the West Ham Corporation for an additional loan of £74,600 for their electricity undertaking. A promise had been made by Mr. Hugh Seabrook that he would tell the Inspector (Mr. H. Ross Hooper) how the charge of 0·37d. per unit under one of the power contracts of the department was made up; but he failed to produce the particulars when Mr. Hooper coutinued his inquiry—the excuse being that a spring clean had upset his papers. It is a strange thing that an electrician's office should require a spring cleaning; it is quite contrary to the rules laid down for householders in electrical literature. However, if the paper exists, and it could not be found, then Mr. Seabrook must have a big office, and a lot of papers in it. If too, the paper is actually lost, it ought not to be beyond Mr. Seabrook's capability to work out the particulars afresh. Had he really desired to give the items composing the charge, he could have managed it. Where there is the will, there is a way. Still he continued to hold that the figure was a remunerative one; and he could not have done this, had he been totally ignorant of the constitution of the figure. He also averred that all the consumers were treated alike regarding capital expenditure. Against Mr. Seabrook appeared Mr. Stewart Russell and Mr. W. H. Patchell, both electrical engineers of standing, and both of whom averred that the price named could not be remunerative. The figure might pay if the capital charges were ignored; but both experts regarded it as unsound finance not to spread the whole of the capital charges over the entire business. Mr. Seabrook has shuffled from a complete justification of the 0·37d.; and there will be not a few of his professional friends who would have been pleased to have seen him more candid and bold over the matter. Regarding the point made a fortnight since as to the rating of the concern, the overseers desire it to be known that they have on more than one occasion tried to get the Assessment Committee to properly assess the undertaking.

The electricity department of the Dublin Corporation does not appear to be capable of leaving its bad history behind, and producing something better and more satisfactory. Occasionally, the concern is supposed to have "turned the corner;" but it is not long slipping back again. Predictions are made as to a more glorious future; only to be falsified by a more dismal financial return. The ratepayers have given it direct aid to the not insignificant sum of £54,000, besides paying very dearly for electric lighting for illuminating part of the public streets. A most pertinent question was put just recently, at an inquiry, held by Mr. P. C. Cowan, Chief Engineering Inspector of the Local Government Board for Ireland, into an application for additional loans for the concern. Why, it was asked, should the non-users of the electric light have to pay a penny in the pound for the benefit of those who use the electric light? A fitting reply to the question is still being sought. It is now proposed to considerably add to the capital expenditure—by £103,000—in order to extend the distribution system outwards. The ratepayers cannot see—not because their intelligence is obtuse—how this is going to improve the condition of the affairs of the concern; but unfortunately some £40,000 has already been spent in anticipation of the sanction. The ratepayers representatives point out that there are already no less than 35 thoroughfares in which there are cables with only one electricity consumer in each street. That is not a cheerful outlook; and it is rationally argued that, if the Corporation cannot make the system pay in the centre of the city, they cannot make it pay outside. It is frequently noticeable in connection with municipal electric lighting concerns that the technical advisers invariably counsel the local authority to set about spending, in order to "improve" the financial position, more capital in districts where the return on the expenditure will be much less than that obtained from the more central area. Another point that has wider application than to Dublin only has connection with the new metallic filament lamps. Mr. Ruddle, the Corporation Electrical Engineer, is of opinion that it is only fair the consumers should share with the Electricity Department the savings effected by the metallic filament lamps. A short time since, other of the Council's officials expressed a similar opinion; and the Electric Lighting Committee recommended that the price of current should be raised. The Council rejected the recommendation; and now it transpires that some—not all—of the councillors who are electricity consumers threw in their weight on the side opposing an increase. That is one of the troubles associated with municipal trading in electricity. Self-interest counts. There are frequently several tradesmen who are members of the local authority who are users of electric current; and these can usually be depended upon to vote in favour of the proposals of the Electricity Committee, gravely speculative though they be. As Mr. Cowan said at the Dublin inquiry, this is a strong argument against municipal trading in electricity.

Possibly several of the councillors of Canterbury are interested, as consumers in electricity, and are willing to vote anything that

the ratepayers generally will have to pay for in order to assist the municipal electric supply undertaking. We should like to see greater discrimination by municipal councillors between their original and legitimate functions as local administrators and the secondary and not essential duties that they take upon themselves when they become municipal traders. Looking over the accounts of the Canterbury Electricity Department for the year ending March 31 last, it is remarked that the total income from private consumers amounted to (less discount and allowances) £5040. Compared with this, the ratepayers, whether they like it or not, were forced to be customers of the department, to the amount of £3315—made up of £2430 17s. for public lighting, and £884 8s. for lighting, power, and heating in the Corporation departments. The lighting that the public has to pay for in this way could be done for quite £1000 less by incandescent gas-lamps, and with greater efficiency. Municipal trading in electricity has much to answer for in causing such a serious departure from the old and well-established principle of economy with efficiency in local administration. In the figures quoted above are some conspicuous items when placed in comparison. For power and heating supplies, the Corporation departments paid in the year £531 17s. 1d., against an income of only £448 4s. 6d. for these purposes from all other consumers.

The people of Canterbury, it is evident, have not yet become converted by the egregious claims of the electricians in respect of power and heating by electricity to a full belief in its superiority for these purposes over other forms of accomplishing the same useful work. The Corporation departments are the best customers of the electricity undertaking in these particular directions; and their affection has to be paid for out of the public purse. It is also noticed that the Canterbury accounts contain no provision for depreciation, which provision was being earnestly advocated by the Chief Electrical Engineer of the Manchester Corporation the other day in his capacity of President of the Incorporated Municipal Electrical Association. Glancing down the items of expenditure on revenue account, it appears that a number of the charges have been trimmed very fine in order to make expenditure and income, after meeting interest, repayment, and sinking fund, show a balance to the good. That balance amounts to £93! For example, it is remarked that in the course of the year only £19 11s. 3d. has been spent on the upkeep of buildings, £328 on engines, boilers, machinery, and plant, £91 on mains and house services, and £39 on meters, switches, and other apparatus on consumers' premises. The charge for rates and taxes, too, is £520. The ratepayers of Canterbury have nothing to be proud of in their electricity department. It takes largely from them; it gives them less than if the concern was in the hands of a private company. If it had been a concern run by private enterprise, we venture to think there would not have been such a large proportion of the income derived from the public purse as now through the compulsory public patronage of the concern. If it had been a private concern, would not the item of rates and taxes be higher than it is now?

Retirement of Mr. G. F. L. Foulger.

It is with regret, which will be shared by many friends, that we have to announce the withdrawal of a personality that has had prominent place in the active official work of Metropolitan Gas Supply over upwards of forty years. We refer to Mr. G. F. L. Foulger, the Chief Distributing Engineer of the Gaslight and Coke Company. Readers will remember that Mr. Foulger last October had the misfortune to lose one of his legs through sarcoma—a misfortune, coming without warning, that would have undone many men of less physical calibre and strength of nerve. In view of the activities required by his office, Mr. Foulger felt that the loss of a leg had depreciated the value of his services; and though the Governor of the Company (Mr. Corbet Woodall) wrote cheering letters, and informed him that the Directors, his office, and his colleagues were awaiting to welcome him when he felt fit to return, Mr. Foulger determined to retire. During the weeks and months following the operation, the sufferer received many sympathetic messages from the Governor, the Court of Directors, the members of the staff, and even from the workmen at their meetings; and these will be preserved by him among the cherished testimonies of friendship which reached him during his trial. It was with sincere expressions of regret that the Directors received Mr. Foulger's decision, more especially as they knew that the Chief Distributing Engineer was far from being "played out," if the term may be allowed. However, arrangements have been made by which his long, and it may be said unique, experience will be secured to the Company. He has been retained, in respect of the Distribution Department, in a consultative capacity to the Board direct; the engagement carrying with it recognition supplementary to Mr. Foulger's retiring allowance under the Company's superannuation scheme. It is readily conceivable that many things may occur in connection with such a vast and intricate distributing system as that of the Gaslight and Coke Company. The gratifying feature of the retirement is that, notwithstanding the trouble through which Mr. Foulger has passed, he is in splendid health. The fortitude with which he has borne a deprivation that is great for one of his active disposition is to those who know him a striking illustration of a recognized characteristic.

THE LATE MR. W. A. VALON.

Some Pioneer Work.

In the time available for the preparation of the notes of the late Mr. Valon's life-work which appeared in the "Journal" last week, we could only bring together some of its principal features. Two others, however, which have since occurred to us, should be recorded.

Some of our readers may remember that in the autumn of 1878 arrangements were made—to the consternation of many people in the gas industry—for a trial of the Jablochkoff system of electric lighting on the Thames Embankment and the Holborn Viaduct. Before these places were actually lighted, Mr. Valon carried out a demonstration at Westgate-on-Sea, with the view of assisting in determining whether the new illuminant was applicable to public street lighting, and to ascertain its cost in comparison with gas. In this exhibition, which consisted of six electric lights kept going for four hours each evening during the month of December, he was associated with the late Mr. W. H. Bennett, the then Secretary of the British Association of Gas Managers. The lamps were arranged along the sea-wall; and on the occasion of the first display, Mr. E. F. Davis, the proprietor of the Westgate Gas and Water Works, conveyed a select party of personal friends, together with several scientific gentlemen and representatives of the Press, to Westgate to witness it. In the course of the proceedings, Mr. Valon stated that, though as a younger man he believed electricity as a lighting agent might some day interfere very materially with the consumption of gas, he was convinced that the promoters of the electric light could never interfere, or favourably compete with the suppliers of gas. Early the next year, Messrs. Bennett and Valon presented their report, which was entirely in favour of gas. They showed that for about £16 it would furnish an amount of light which it would cost £40 to produce by electricity. The publication of the report had a decidedly reassuring effect.

Another noteworthy feature in Mr. Valon's career was the introduction of the prepayment gas-meter system into Ramsgate. In January, 1889, his Committee had before them a scheme formulated by him for putting pipes and fittings into houses not supplied with gas, in order to facilitate its use; and a few months later the Corporation decided to adopt the scheme, and to fit up houses at a rental not exceeding £30 per annum with supply-pipes, meter, plain brackets, burners, and a boiling-ring. In referring to the matter at the time, we pointed out that the fundamental proposition of the Corporation was "qualified and explained by a series of supplementary recommendations which served, among other purposes, to introduce a prepayment meter." Such a meter Mr. Valon had invented. It was of very simple character; its principal feature being the introduction into the wheel work of the index of a "stop" capable of being set in advance by a key at any desired figure, on reaching which point the meter would cease to pass gas. For this contrivance Mr. Valon took out a patent in the spring of 1889, and subsequently other patents for improvements upon it, and for applying it to wet meters.

Reference was made last week to the construction by Mr. Valon of a water-tower in connection with the Ramsgate Water-Works. It should have been mentioned that associated with him in this work was the late Mr. George Wilson Stevenson.

The funeral, which was quite private, took place at Kennington Lees last Tuesday. It was attended by Mr. James W. Helps, the President of the Institution of Gas Engineers, who, on the previous day, had in that capacity addressed a letter to Mrs. Valon, expressing his personal sorrow to hear of the sad loss she had sustained, and offering to her and the family, on behalf of the Council and members of the Institution, their sincere sympathy with them in their bereavement. Mr. Helps referred to the fact that Mr. Valon had belonged to the Institution for the long period of thirty-seven years, had served as its President, and had in other ways been most active in its interests, as amply testified by its "Transactions." "The geniality of his character and the high professional attainments he possessed," had, Mr. Helps added, "secured for him an enduring and honoured name among the leaders of the industry."

OBITUARY.

GEORGE DAVID BELLAMY.

An interesting link with the past of Plymouth has been severed by the death on the 3rd inst., at Plympton, in his 76th year, of Mr. George David Bellamy, who was at one time closely connected with the water supply of the town. Early in his professional career, Mr. Bellamy obtained the appointment of Assistant Engineer, under Mr. J. C. Newland, the Borough Engineer of Liverpool, in the Corporation Water Department. In December, 1864, he went to Plymouth in order to take the position of Assistant to Mr. Robert Hodge, the Borough Engineer, on whose retirement the water and borough engineering departments were separated, and Mr. Bellamy was appointed Water Engineer. He spent a great deal of time in trying to form a reservoir at the Head Weir,

near Sheepstor; but being unable to find a reliable foundation, he abandoned the scheme, and advocated the construction of a reservoir at what is known as the Harter site, which, however, after some years of controversy, was in turn abandoned in favour of the Burrator scheme, now materialized in the extensive reservoir among the hills of Dartmoor. Mr. Bellamy also proposed to pipe the leat from the Head Weir to Plymouth, and strongly advocated iron pipes instead of concrete; and he succeeded. As Water Engineer, Mr. Bellamy rebuilt Drake's Place reservoir and pleasure-grounds as they at present stand. On the death of Mr. Alty, who succeeded Mr. Hodge as Borough Engineer, Mr. Bellamy was made both Borough and Water Engineer. In this capacity he designed and carried out the large scheme of drainage, with storage tanks contiguous to Sutton Harbour, and the outfall at Fishers' Nose, which was afterwards incorporated by the late Mr. Mansergh in the present main drainage scheme. For the artistic and eminently practical manner in which Plymouth Hoe is laid out, present and future generations have to thank Mr. Bellamy, who also planned the laying out of Beaumont and Freedom Parks, as well as the reconstruction of the Hartley reservoir and grounds. He retired from active work under the Corporation in 1892, but was retained as Consulting Engineer up to his death.

The death occurred recently, at Littlehampton, in his 66th year, of Mr. Edward Yorke, who was at one time on the Board of the local Gas Company, and since his retirement from the business of a grocer and provision merchant had been their collector. The deceased had been Chairman of the Urban District Council.

We regret to record the recent death, in his 56th year, of Mr. William H. Parker, the Secretary of the Wakefield Gas Company. Up to about a fortnight ago, he appeared to be recovering from heart troubles following an attack of influenza. But pneumonia supervened; and to this he succumbed. He had been in the service of the Company for thirty-one years, and succeeded the late Mr. J. W. Whitaker in the secretaryship.

Members of the Midland Association of Gas Managers will, we are sure, join with us in the regret generally felt throughout the Potteries district by the death of the venerable Mayor of Longton, Alderman Aaron Edwards, J.P., C.C., which took place at his residence, Lansdowne House, on Thursday morning last. Deceased, who was in his 77th year, was in his usual health until the 25th ult., when he was taken seriously ill. He, however, rallied, and was apparently making satisfactory progress, when he had a severe relapse, and eventually succumbed to an affection of the heart. From humble beginnings, and with little means of education, Alderman Edwards, by great perseverance and industry, won his way to commercial prosperity; rising from the operative potter's bench to the position of a leading manufacturer. For nearly fifty years he had taken an active part in the public life of his native town; and the hearty welcome he accorded to the members of the Midland Association, on the occasion of their visit to Longton—the home of their President (Mr. W. Langford)—on the 20th of May, will be long remembered by all present. It gave him much pleasure; and he evinced it by going through the whole of the programme as host. In connection with that visit a sketch of the life-work of Alderman Edwards was given in our columns. Out of respect for his memory, flags were floated at half-mast on the Town Hall and other public buildings, as well as on the Town Halls of other Potteries towns. It was arranged that the funeral should take place yesterday.

PERSONAL.

Mr. George Chaston, on the 28th ult., retired from his position as Superintendent of the Lowestoft Gas-Works. He has been granted a pension by the Directors of the Company; and it has been decided to divide the duties of the position between Mr. Chaston's former Assistant and the chief of the staff at the town office.

Readers of the "Journal" will unite with us in wishing Mr. Samuel Wood full enjoyment of his well-earned retirement from active life in the City. Mr. Wood was formerly connected with Mr. Alfred Lass in his accountancy business; and on that gentleman's retirement, he continued the firm with Mr. Ernest Drew, under the title of Wood, Drew, and Co. On now severing his own connection with the firm, Mr. Wood has gone to live near Bournemouth; but Mr. Drew is, of course, still keeping up the old professional connections.

An electro-hydraulic portable riveter, designed by the Maschinenfabrik Oerlikon, of Zurich, has an electric motor driving a pump permanently attached to a riveting frame, with a gap 30 inches deep and 16 inches wide. The motor is from 4 to 6 H.P., making 1420 revolutions per minute, and drives a reciprocating pump by means of a worm reducing-gear and a pair of connecting-rods. The pump is a differential piston pump, and makes 170 strokes, $1\frac{1}{2}$ inches, long per minute, using a non-freezing mixture of water and glycerine. The riveting cylinder is 6·3 inches diameter, has a $2\frac{3}{4}$-inch stroke, and is built for a maximum riveting pressure of 90,000 lbs.

MR. JOHN LAYCOCK AND KEIGHLEY.

An interesting event took place at Keighley after the Council meeting on the 1st inst., when the chief officials of the Corporation met at the Town Hall and made a presentation to Mr. John Laycock on his retirement from the position of Gas Manager.

Mr. A. Lister (Borough Treasurer), in making the presentation, which consisted of a silver rose bowl, said the object of the meeting was a very pleasing one—to show their high regard and esteem for Mr. John Laycock, the retiring Gas Engineer and Manager, and to express, on the one hand, their feeling of regret that he was ceasing to occupy the position he has filled with so much credit to himself, and, on the other hand, their high appreciation of the courtesy and kindness with which he had associated himself with his brother officers for a long term of years. Continuing, Mr. Lister said:

Mr. Laycock has had a unique service (one that hardly any official has had with the Corporation) of 50 years, 42 years of which were as Engineer and Manager of the gas-works. The best of this service is that it seems to have grown in importance as years have rolled by; and the people of Keighley have appreciated his services more and more as those years of service lengthened. If we look at Mr. Laycock's record, and take a few facts which are patent to all, the value of his services can be best appreciated. The gas-works capital account stood at £20,076 when Mr. Laycock was appointed Manager. It is now over seven times that amount. In 1867, only 4552 tons of coal were used; in 1908, 28,984 tons. In 1867, 40,535,000 cubic feet of gas were made; in 1908, 337,372,000 cubic feet were made. The gas per ton in 1867 was 8904 cubic feet; and in 1908, 11,640 cubic feet—an increase of 2736 cubic feet per ton. During the years that Mr. Laycock has been Manager, the sum of £149,278 has been utilized for other than gas-works purposes, and during the past ten years the average amount utilized for these purposes has been over £6000 per year. So that it will be seen what an important factor the gas-works have been in keeping down the rates. It is estimated that the Corporation have a surplus asset in the gas-works—that is, an asset after meeting all liabilities—of over £200,000; and this without including anything for goodwill. I have more than once expressed myself with regard to the value of the assets of the Corporation; and I am very optimistic with regard to the financial position of Keighley. I always say keep down the rates in a reasonable way; and the rates have, I think, substantially benefited owing to the satisfactory working of the gas undertaking. Mr. Laycock is not alone in long public service in Keighley. My own connection with Mr. Laycock has been a very pleasant and lengthy one. I have been most happy in my association with him; and I feel a considerable amount of regret that he is about to discontinue his services as Engineer and Manager. With a constitution unimpaired by irregularities, and a mind I am sure well stored, we may hope that Mr. Laycock will have many years before him. The thought of a well-spent life will be a source of satisfaction to him, and will enable him in his quiet moments to review his past with pleasure. We hope he will have many happy years before him; and we all entertain the kindliest feelings towards him and the best of wishes. We are glad that Mr. Laycock is to remain as Consulting Engineer; and I feel sure he will give the benefit of his great experience, his sound judgment, and his practical and technical knowledge to his successor, Mr. Baillie, when desired. We welcome Mr. Baillie among us, and hope he will have a very happy time in Keighley.

Mr. Lister then read the inscription, which was as follows:

"Presented by the Officers of the Keighley Corporation to John Laycock, Esq., Gas Engineer, upon his retirement after nearly fifty years' service. June 30, 1909."

Continuing, Mr. Lister said: On behalf of my brother officers and myself, I present to you this silver rose bowl as a small token of our regard and esteem and with every wish that God's blessing may rest upon you in coming years.

Mr. Laycock, in responding, heartily thanked Mr. Lister for the kind things he had said in making the presentation, and acknowledged that the success that had attended his management of the gas-works had been largely due to the faithful services of his co-workers. He continued:

I have been a long time connected with the old Local Board and the Town Council; and this length of service makes me think that I am getting old. I can go back a long time. I remember when I came to the Local Board as a lad, the Clerk was Mr. William Burr. At that time the only other officials were Mr. John Sharp, the Surveyor, and the Collector. There was no Inspector of Nuisances, no Electrical Engineer, no cemetery belonging to the Local Board, no baths, no Education Department, and the water-works were in the hands of a private Company. It is marvellous that, in my time of service, the town has grown at such a tremendous rate. We have had some splendid men as members of the Local Board and Town Council. But I think the officials who have been responsible for a good deal of the work that has gone on, have been very good men, so far as I am able to judge. I think we have never had a failure. I am exceedingly obliged to you, gentlemen, for the handsome present you have made me; and I shall take it with me into semi-private life, where it will remind me of my friends here. It will remind me of the Council meetings, and of what you are trying to do—your duty. I leave the work without uneasiness. I have had a long innings; and I think I am entitled to a rest. It is a pleasure to me to be able to leave without being compelled to do so through any physical infirmity.

It appears that Germany has now obtained the £25,000,000 required to meet the ever-growing liabilities of the Empire. Among the articles subject to tax are gas-mantles and electric lamps, which are expected to yield £1,000,000.

NOTES FROM WESTMINSTER.

With the settlement effected during last week on the Alliance and Dublin Consumers' Gas Bill while the promoters' case was being laid before Sir Luke White's Committee, the contested work on the gas measures has been practically brought to an end. There is a little doubt still lingering as to the Gaslight and Coke Bill, inasmuch as the London County Council and the West Ham Corporation have lodged petitions against it. But in regard to these authorities, it is difficult at present for the outside observer to see the object of their petitions, unless it be for protection purposes against any alterations in the Bill detrimental to the interests over which they appear to be so solicitous, and, of course, the West Ham Corporation may have it in mind that there is yet a chance, in the future progress of the measure, to get amplified the terms conceded them by the Company in the House of Lords. But a short time will disclose the purposes of the petitions; for the measure stands in a group of Bills referred to a Committee under the chairmanship of Lord Clifford of Chudleigh. Meantime, in the settlement that was come to in connection with the Alliance and Dublin Consumers' Gas Bill lies practically the only interest in the proceedings associated with the emerging of that Bill from the Committee stage in the House of Commons. A good piece of news is afforded in the success of the Heywood Corporation in obtaining a gas stand-by clause in their Bill.

Salford's Undignified Retreat. The hope of the Salford Corporation in regard to their Bill has been frustrated by the authorities of the House of Commons standing firmly by the House of Lords in declining to allow the withdrawal of the part of the measure relating to the gas undertaking, and proceeding with the remainder. The choice was as between the whole Bill, including the profit-in-aid-of-the-rates limitation, and the condition as to payment for all gas used for public purposes, or the withdrawal of the complete measure. The choice has been the latter; so sacrificing all the money, time, and trouble expended on the measure up to the present, rather than relinquish part of the several thousands a year that have been appropriated from the gas consumers. The action throws a strong light on the libertinism of municipal trading. It was for the Corporation to choose; and they have done so. But the taking of such a drastic step as the withdrawal of the whole Bill (the Council did the same thing in 1895, when a Commons Committee suggested a limitation of profits) rather than surrender a portion of the profits made by the gas consumers and scattered broadcast among others besides those who contribute to the profits, has only accentuated what there is little room for doubt is the unanimous intention of the parliamentary authorities in this matter. And this will assist the more it becomes known in curbing the appetites of local authorities for profits in aid of the rates from their trading ventures. Noticeable has been the effect here and there, since the decision of the Lords on the Salford Bill, and that of the Commons on the Oldham Bill, in the uttering of warnings by councillors to colleagues to exercise more restraint. But what about the expense to which the outside authorities of Salford were put? Money was spent by them, an excellent fight was made, and the House of Lords gave judgment in their favour; but a lesser body—the Salford Corporation—has overridden the most august assembly at Westminster. When this can be done, what is the good of talking so much about the abolition of the House of Lords? However, the Corporation are going to start afresh next session with a Bill *minus* the gas section. But what of the sworn evidence given a few weeks ago, that all the available gas plant would be in use in 1911-12; and that there is no room on the present site for extensions?

An Irish Agreement. Three days of the time of Sir Luke White's Committee were wasted last week in hearing speeches of Counsel, and evidence of witnesses on the Alliance and Dublin Consumers' Gas Company's Bill; and the while heads were being put together in the corridor outside to see whether a peaceful solution of differences could not be arrived at. It was a difficult job; but we must give the parties credit for assiduity in the matter. It was a study to watch the frequent poppings-in and the poppings-out of our Corporation and Gas Company friends from the capital of Ireland, with solemn countenances, betokening a deep consideration of most momentous issues. More than once they got near the end of a complete arrangement. But these are stubborn fighters for their own hand; and it took time to make a clean job of the matter. So far as the proceedings on the Bill actually went before the Committee, there was little difference in them from those in the Lords. Counsel, advisers, and witnesses were the same. The Board of the Company were represented; together with the Secretary and Manager (Mr. Francis T. Cotton) and the Engineer (Mr. W. F. Cotton, jun.). Retained by the Company were Mr. Corbet Woodall, Mr. H. E. Jones, Mr. Charles Hunt, Mr. E. H. Stevenson, Mr. W. R. Herring, Mr. Arthur Valon, Professor Vivian B. Lewes, Mr. John F. Simmance; while on the opposition side were Mr. William Newbigging, Mr. Isaac Carr, Mr. J. G. Newbigging, and Mr. William Cash. The Bill is to authorize the conversion of the capital, to give additional money powers, to empower the improvement of the works, to sanction 14-candle power gas, and the use of the "Metropolitan" No. 2 burner in testing, together with other purposes. Regarding the extension of the limits of supply, two small areas have been cut out of the Bill, and £20,000 less capital was in consequence asked for by the promoters. The Company have had a good many ups and downs in their history, an extraordinary district to supply, some uncommon conditions under which to work, and a local governing body to work with whose conduct in their dealings with the Company has not been consistently without traces of undue officiousness. This is putting the matter mildly. In connection with the Bill, the Corporation were again seeking to keep the Company from getting abreast of the times.

Some of the Terms. However, the case for the Bill was prosecuted with vigour; but Sir Luke White, with the businesslike air that is characteristic of him, trimmed it here and there, by neatly cutting off any attempt to go into general matters, and by declining to hear repetition evidence. The result was that, although a couple of days were absorbed in presenting the Company's case, that time was much less than it would have been otherwise. And with the ending of the case for the Company, towards the close of the second day's sitting, there came the intelligence that, while the contentious work had been proceeding within the room, the friendly discussions outside had eventually resulted in a settlement of differences, so that beyond ratification there was nothing more for Sir Luke and his colleagues to do. No one seemed sorry; but there appeared to be a feeling that the Company had been too generous, and had conceded more—perhaps much more—than the Committee would have ordered them to do. Whether the Corporation will long remember this generosity cannot be said; but it ought to go to the Company's credit, and help to maintain more peaceful relations. There is to be a uniform price for gas within the bounds of the city; but differential prices in specified areas beyond. The standard price drops a bit more—to 3s. 7d., from the former 4s. 1d. Seeing, however, that the full dividend has never been paid, the standard price has not hitherto stood for much to the shareholders. Moreover, with hereafter 14-candle gas tested by the modern burner, as compared with 16-candle gas tested by the flat-flame burner, reductions in prices to the advantage of both consumers and shareholders, should be more frequent in future. The additional capital is to be reduced to £300,000, with one-third borrowing powers. The special purposes fund is to be limited to one-twentieth part of the paid-up capital, and be accumulated by yearly contributions of ½ per cent.

Gas Prices Based on Coal Charges. These are the main heads of the settlement to be incorporated in the Bill; but there is yet another agreement which is unique, but which is of quite a temporary nature, and to which there would be serious objections were it otherwise. During the three years that the agreement will apply, it will be in effect supplementary to the ordinary sliding-scale. The price charged for gas to the consumer is to be reduced to 3s. 4d. per 1000 cubic feet.; so that the consumer may have immediate benefit from the economies to be realized under the Bill. The price of 3s. 4d. is not to be exceeded so long as the average price paid for coal is not above 13s. 6d. per ton c.i.f. But for every shilling the average price of coal rises above 13s. 6d., an extra 1d. per 1000 cubic feet may be charged; and for every 1s. the price of coal falls below 13s. 6d., the charge for gas is to go down 1d. There are pitfalls in the arrangement; and one is, supposing the average price of coal goes up to 14s. 4d. or 14s. 5d., and circumstances were such that an increased price of gas was desirable, the Company under the agreement would be unable to advance the price. However, the arrangement is only for three years, so that it may be regarded as having nothing more about it than a willingness to afford passing satisfaction. The matter, however, recalls to mind that there have been a few novel arrangements in recent times to effect settlements. An agreement was made last session which effectually put into abeyance for a few years the operation of the sliding-scale so far as the proprietors of the Company affected are concerned; a dual system of testing—for illuminating power and for calorific power—has been agreed to in meeting opposition; and now two concurrently operative sliding-scales come into being, one of which, however, only operates for three years. No one can say that inventiveness and diplomacy are yet dead among those who help to make the administrative laws of the gas industry.

Non-Paying Slot Meters. In several Bills the past two or three sessions, attempts have been made to provide against loss in respect of prepayment meter users whose consumption is insufficient to meet the capital charges incurred in providing the meters. The matter was discussed at length on the Heywood Corporation Bill; and from what then transpired, it will be seen that the authorities of the two Houses have now arrived at what may be regarded as an understanding on the subject which is likely to be incorporated in future legislation where protective power is required. The matter is referred to in our editorial columns; and a discussion on it will be found in the report of the proceedings on the Heywood Bill in our "Parliamentary Intelligence." The only regret is that the discussion was not a little more explicit; and the same may be said of the terms of the clause adopted.

Another Stand-By Success. For the second time this session, there has been success in obtaining a stand-by gas clause. In their consistence in giving electricity suppliers protection in this matter and refusing it to gas suppliers, Parliament has been inconsistent in dealing out justice. They are reforming their ways. Protection has been allowed in the Mountain Ash Bill; and a conspicuous success has been scored by the Heywood Corporation, both in regard to stand-by gas

supplies to private gas plants and to establishments using electricity. But there has been a variation from the terms of the ordinary stand-by clause, as will be seen in our leader columns, to which comment on this matter has been transferred. Special attention should, however, be directed here to the diagrams and tables given in our "Parliamentary Intelligence." They are very instructive.

BLAU'S LIQUID ILLUMINATING GAS.

In the "Journal" for June 23, 1908 (p. 842), we gave some particulars in regard to the process of Herr Hermann Blau for the production of a new kind of illuminating gas. An English patent has been applied for, and we understand the specification is open to inspection. A French patent has, however, been taken out (No. 398,839); and the specification, of which the following is a translation, has lately been published.

Experience has demonstrated that in the manufacture of illuminating gas the bye-products are profitably utilized by treating the crude products in the retorts with gases at a very low temperature. If this method produces good results from the point of view of the quality of the bye-products, it is also attended by the inconvenience due to the formation of a considerable quantity of hydrogen carbides, boiling at from 30° to 100° C., which by carburation, pass into the distilled gas, and are then necessarily in the liquid illuminating gas subsequent to compression. After running off the liquid gas at atmospheric pressure or at slight pressures (two or three atmospheres), as is the ordinary case for the employment of the gas, the main part of the hydrogen compounds again become liquid, without subsequently being capable, by carburation, of being incorporated with the gas; thus causing loss. This inconvenience is avoided, in the present invention, by compressing and liquefying the distilled gas, not in the usual way by two or three successive compressions, but by discontinuing compression after the first or second, to extract the liquid hydrogen carbides producing super-carburation which have already separated during this compression. Only after this is compression of the gas continued until complete liquefaction.

By the proper determination of the degree of pressure, which depends upon the mode of work and also upon the nature of the gaseous bodies, the carburetting constituents can be eliminated sufficiently to prevent the formation of deposits when the gas is subsequently utilized. As the carburetting constituents of the gas have, when liquid, the property of dissolving an appreciable amount of the most valuable properties of the gas itself, and as, according to Dalton's law of absorption, solubility increases proportionally with pressure, considerable quantities of gas are lost by escaping from the saturated liquid under pressure, as soon as they are conveyed from the condenser into a receptacle communicating with the atmosphere. To avoid this, and to regenerate these gases in a simple way, the saturated liquid, instead of being run into a receptacle communicating with the atmosphere, as described, is conveyed to a vessel connected by a pipe to the suction-pipe, so that the gases which, under the effect of lower pressure, are disengaged from the super-saturated liquid are mixed with the gases drawn by the compressor, and are thus regenerated.

The patentee puts forward two claims. The first is for a process to manufacture liquid lighting gas characterized by the following features: The distilled gas employed is compressed by subjecting it, after the usual purification, to a slight pressure at the normal temperature maintained by cooling with water, and the liquid carbides are extracted, which have been deposited during this first operation. The gases thus treated are then compressed at a sufficient pressure to completely liquefy them, after which they are bottled in steel cylinders to prevent the super-carburetting of the gas, and consequently the subsequent precipitation of the liquid carbides and the resulting loss of them in use. The second claim is that, under pressure from the suction-pipe, the liquid carbides, separated by compression, and saturated with compressed gases, are run into a receptacle inserted in the suction-pipe or connected with it by the gas outlet-pipe, with a view to regenerate the gases which, owing to reduced pressure, have been liberated by the liquid carbides.

Vertical Retorts—A Reminiscence.

Mr. Robert Dempster, senr., of Eden Hall, Penmaenmawr, writes: "Vertical retorts are coming to the front. I well remember when I was a boy of twelve (about the year 1840) seeing vertical iron retorts at work at the Cupar Gas-Works—my native town. Mr. John Honeyman, the Manager, abandoned them because the stokers could not stand the heat in discharging."

Advices have just reached England to the effect that Mr. A. W. Piper, a well-known Adelaide barrister, has been appointed by the Supreme Court of Western Australia Umpire in an important arbitration case between the Perth Gas Company and the City Council, relative to the amount to be paid by the latter for the purchase of the Company's plant, &c.

THE DESSAU VERTICAL RETORT PATENT.

Arguments and Judgment in the German Patent Nullity Action.

The official *précis* of the pleadings and judgment in this important case in the German Courts have now been published. The decision of the Court in favour of the validity of the German patent had been given on April 24 last;* but as the pleadings and the grounds on which the Court gave its decision are of general technical interest, the following summary of the official judgment has been prepared.

The case was an appeal from a decision of the Imperial Patent Office, given in February, 1908, upholding the validity of the vertical retort patent dated July 29, 1903. The plaintiffs and petitioners were the firm of August Klönne, of Dortmund, and the defendants and respondents the German Continental Gas Company of Dessau and Dr. Julius Bueb. The case was heard before the First Civil Court of the Imperial Courts, sitting under the Presidency of Dr. Plank. The Court upheld the decision of the Imperial Patent Office in favour of the defendants, and ordered the plaintiffs to pay the costs of the action.

The facts of the case are then set out as follows: The defendants were granted a patent, dated July 29, 1903, for the "Manufacture of Gas by the Use of Vertical Retorts," in which claim was made for "A process for the manufacture of gas by the use of vertical retorts diminishing suitably in size towards the top, characterized by carbonization being conducted in a retort with the object of producing illuminating gas poor in naphthalene with recovery of coke of high value and of tar of the nature of brown oil poor in carbon and freely fluid, the retort being heated above the temperature customary in gas manufacture (to 1300° to 1500° C.), and completely filled with coal so as to avoid any free space in which tar might be separated below." The details, the object aimed at, and the advantages claimed are stated in the specification.

The petition for the quashing of the patent alleged want of novelty in the patented process at the time of application. Reference is made to the British patent No. 5712 of 1828, American patent No. 447,506 of 1891, and German patent No. 14,050 of 1880, in which vertical retorts enveloped by furnace gases in a number of superposed zones are provided. Reference is also made to literature as follows: Dürre on modern coke ovens, 1892, recommending the complete filling of retorts with coal; and Körting in the "Journal of Gas Lighting" for 1896, where the high temperatures adopted in the patent are recommended. The plaintiffs also refer to the use of the latter in a communication of the Gas Manager, Dr. Pfeiffer, of Magdeburg. The plaintiffs have used the zone method of heating in their gas-works plant since 1880. The channel in the coal, which is formed, according to the patented process, in the interior of the retort has been described and utilized by Hilgenstock in the papers "Stahl und Eisen" and the "Journal für Gasbeleuchtung."

The defendants, on the other hand, lay stress on their process being a combination which had not as such hitherto been used or described, and which offered conspicuous advantages.

The Imperial Patent Office refused to quash the patent, for reasons which they gave. The plaintiffs in making their appeal at the proper time laid stress on the fact that the original application for the patent did not mention the heating to 1300° to 1500° which is now claimed, and that no overstepping of the customary temperature was therefore specially aimed at. The patent is in this seriously defective, and by itself this should lead to its being annulled. The Patent Office, moreover, proceeded from wrong premises in arriving at its decision. It was, they say, incorrect that the knowledge that the formation of naphthalene was due to too strong heating of the gas in the retort was novel at the time of the application. Also the gas in vertical retorts comes in contact with the walls of the retorts and scurf is formed here also, as the evidence of gas managers Bäcker and Ries showed. High heating occurs also in the setting constructed according to the patents of the plaintiffs, as shown by Herr Kobbert, the Gas Manager at Königsberg. The alleged prior filling of retorts completely has been repeatedly supported by reference to the work of Dürre. From a review of what was prior knowledge at the time of the application, the combination may be arrived at by applying the principles recognized in the gas industry.

The defendants in their written answers have controverted the contentions of the plaintiffs. They concede that the Patent Office has erroneously assumed that the knowledge that too strong heating caused the formation of naphthalene was novel. But for the rest, the position taken by the Patent Office was altogether justifiable, and is upheld by the evidence of Managers Körting and Prenger and competent opinion. With regard to the alleged failure to disclose the process, the defendants explain that the patent originally claimed an "apparatus." By petition on Dec. 14, 1903, they had, however, claimed patent rights for a process, and had in it laid stress on very high heating.

In the hearing before the Civil Court, the representative of the plaintiffs declared that he did not uphold the formal objection. He offered, in regard to his attack on the facts, to produce the opinion of an expert, and supported his offer by producing a private opinion of Dr. Otto Pfeiffer, of Magdeburg. According

* See "Journal," Vol. 106, p. 305.

to the views of the plaintiffs, everything claimed as invention in the patent could result from the use of vertical retorts in conjunction with the procedures which became practicable under modern working methods, and were generally recognized. The representative of the plaintiffs disputed novelty by reference to the English patent specification No. 21,760 of 1898, which relates to vertical or inclined or horizontol retorts. He finally disputed that in practice the process of the defendants was worked at the high temperatures stated in the patent specification. Defendants pointed out in regard to these contentions that Dr. Pfeiffer himself recognized the advantage of producing a gas poor in naphthalene by their process. They have stigmatized as false the statement of the plaintiffs that the temperatures specified in the patent specification were not employed in fact. In regard to the English patent No. 21,760 (which was put in at the last moment), they offer no explanation, but contend that prior to their patent vertical retorts had not been operated anywhere. The defendants also took care to support the correctness of their propositions by expert opinions, and brought forward Geheimrat Dr. Bunte, Professor at Carlsruhe, as an authority.

The patent attacked is a compound patent consisting of the following four principal elements:

1.—The use of vertical retorts.
2.—Complete filling of same with material to be gasified.
3.—Avoidance of a free space for the separation of tar.
4.—Heating above the point hitherto customary—viz., to 1300° to 1500° C.

This combination has been fixed upon for a threefold object:

1.—The production of gas poor in naphthalene.
2.—The production of freely fluid tar, poor in carbon.
3.—The production of coke of high value.

The plaintiffs were not in a position to prove that prior to the application for the disputed patent this combination had been anywhere described or applied for achieving the said objects. The patent specifications put in against this, so far as they refer to vertical retorts, lead to quite the opposite view. At the time of publication of the English patent No. 5712 of 1828, the use of such high temperatures was precluded, as the cast-iron retorts used up to that time could not have withstood such heating. The American patent No. 447,506 provides a free space for the separation of tar and a special draw-off cock for it. The German patent No. 14,050 passes the combustion gases through special underlying chambers communicating the one with the other about the retorts; whereas according to the disputed patent the combustion gases must find their way through the permeable layers and rings of coke in the interior of the retorts.

No matter how the physical and chemical phenomena may be scientifically explained in detail, the patent does what it promises to do. The plaintiffs had not been able to contest that before the application for the disputed patent the use of vertical retorts had not been adopted and tested in practice. They had also admitted that the disputed patent achieved the advantages of producing gas poor in naphthalene, tar which was thin, freely fluid and clear, and coke of high value. The proof which it rested with them to afford—that by the patented process the high temperatures specified as peculiar to it were not applied—was not forthcoming. The knowledge that the admitted advantages are attainable by the patented process constitutes a patentable invention, the great technical importance of which in gas manufacture plaintiffs themselves did not question. When, therefore, they refuse to admit that the process of the defendants possesses the essential quality of an invention, because in the position of technical practice the elements of the process might have been forthwith evolved with the use of vertical retorts, their contention is refuted by the consideration that before the application for the patent now attacked no one had indicated the way or the special advantages which the combination of gas manufacture selected by the defendants presented.

The judgment of the Imperial Patent Office is therefore confirmed, without further evidence being required, by the Civil Court of the Empire.

KEITH COMPRESSING PLANT AT THE IMPERIAL INTERNATIONAL EXHIBITION.

There is to be seen at the Imperial International Exhibition at Shepherd's Bush compressing plant shown by the James Keith and Blackman Company, Limited, which contains several improvements on that fixed by the firm at the Franco-British Exhibition last year.

Keith Compressors at Shepherd's Bush.

As previously, the plant is in duplicate, each consisting of a "National" gas-engine and a 10,000 cubic feet per hour compressor. The actual power taken by the compressor is slightly under 3½ B.H.P. The compressor and engine are direct-coupled by means of the Soveran type of flexible coupling; but the compressor proper is mounted on a cast-iron base, which contains the firm's standard pattern pressure-regulating valve, which valve also acts as a bye-pass when the gas compressed exceeds the quantity required. It is quite automatic in action. There is a special device fixed on this base which permits the valve being lifted off its seat from the exterior; the object being to enable the engine to be started up on no-load. The valve being off its seat, allows a clear passage through the gas-way, so that no compression takes place. When the engine is started, the valve is lowered on to its seat, and takes up its natural duty. The compressors are each fitted with a continuous lubricating device, which is formed by the lower portion of the cast-iron base acting as a reservoir for oil. From this to the sight-feed lubricators a small tube is run. When the machine is started, the compressed gas passes over the oil in the cast-iron base, thereby putting it under the same pressure as the gas itself. This gives it ample power to flow up to the sight-feed lubricators. Of course, directly the compressor is stopped, the pressure goes off; and the lubrication then stops. There is a small filter on the line of piping between the reservoir and the sight-feed lubricators, to prevent any foreign matter choking the sight-feed lubricators.

The plant is running most satisfactorily, keeping up a constant pressure of 60 inches.

The Examinations in "Gas Supply:" Two Corrections.—Mr. J. H. Brearley, the Examiner in the "Gas Supply" division of the City and Guilds of London Technological Examinations, points out that in our editorial notice of the results of the examinations the passes in Honours were inadvertently overlooked. The number of successful candidates should have been 191, as shown by the list we published on p. 21. We also learn that the name of Mr. A. G. Whitehorne, of Eastbourne, who passed first class in the Ordinary Grade, was given as Whitehouse in the list that was supplied to us.

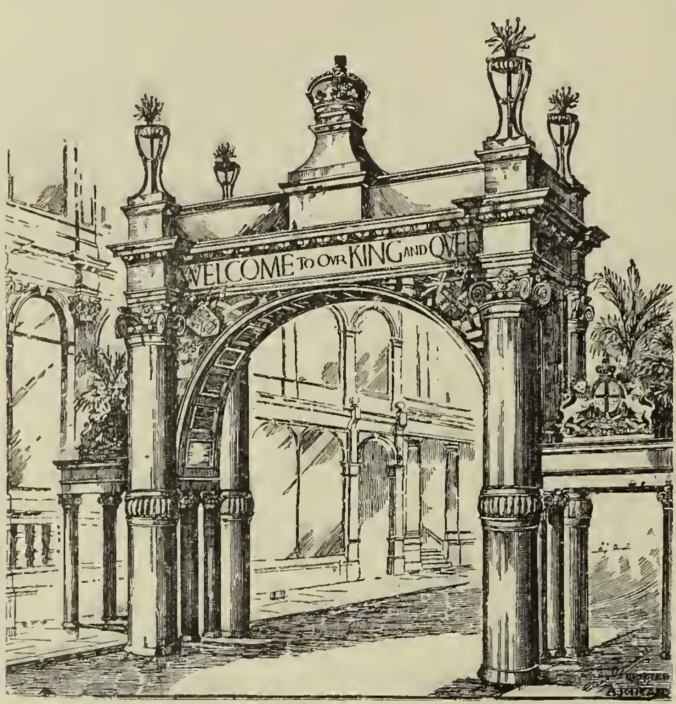
Brussels International Exhibition.—In the "Journal" for the 22nd ult., some particulars were given in regard to this exhibition, which will be held next year. It may be mentioned, in addition, that for motive power the Royal Commission will defray half the charges made by the Belgian Administration on all machinery driven to illustrate processes of manufacture. Exhibitors will pay: For steam (133 lbs. pressure), 0·5 c. per kilogramme; for gas, 1s. 3d. per 1000 cubic feet; and for electricity, 1½d. per kilowatt-hour. Water will be supplied free for pumps or condensers. Not only will there be free crane power, but the laying of foundations by Belgian contractors will be superintended by a competent engineer employed by the Royal Commission.

Large Gas-Engines.—Mr. Percy R. Allen writes in the current issue of "Cassier's Magazine," that it is difficult to say when a gas-engine becomes a large gas-engine. A few years ago 300 H.P. was considered the starting point; then 500 H.P; and now, in a recent article published in the "Zeitschrift des Vereines Deutscher Ingenieure," 1000 H.P. seems to be taken as the minimum. The list gives the names of twenty-eight makers—nineteen on the Continent, four in England, and five in the United States. Altogether, it adds up to a total of 628 engines, giving a combined output of 1,035,709, or more than one million horse-power in large units.

Action of Ammoniacal Manures.—According to a paragraph in the "Journal of the Society of Chemical Industry," Herr P. Ehrenberg has been carrying out experiments which have led him to form the opinion that the assimilation of nitrogen by plants from ammoniacal manures is governed chiefly by the acid reaction of the soil; this acidity increasing as the plant takes up nitrogen from the ammonium salt owing to the liberation of the acid radical of the salt. The addition of calcium carbonate to neutralize the natural acidity of the soil is not sufficient to yield a good crop, especially in the case of plants which do not grow well on acid soils, as the continual formation of acid as the plant absorbs nitrogen tends to inhibit the growth of the plant.

BIRMINGHAM GAS ILLUMINATIONS.

On the occasion of the visit of the King and Queen to Birmingham to open the University last Wednesday, the city was extensively illuminated; and we are glad to see that gas was well in the forefront in these manifestations of loyalty and rejoicing.



Triumphal Arch Erected by the Birmingham Gas Committee.

A Triumphal Arch was erected in Colmore Row by the Birmingham Gas Committee. It was Mr. G. Hampton Barber, the Secretary and Manager of the undertaking, who prepared the original sketch, and who conceived the idea of utilizing gas main-pipes to form the columns of what proved to be an imposing and magnificent triumphal arch, which formed the entrance by which Their Majesties entered Victoria Square. The square itself was decorated with great Corinthian columns, so as to form a Roman forum, flanked on the one side by the Council House buildings, and on the other by the grand old Town Hall, of which Birmingham is so justly proud. The arch (an illustration of which we give) was a massive structure designed in the Roman Doric style; the main columns supporting the superstructure being formed of cast-iron gas main-pipes, 36 inches diameter. Above the flanges of the pipes were enriched capitals supporting an entablature. The main arch, which had a span of 26 feet, and was 31 feet high from the roadway, supported a handsome Tudor crown in crystal, 5 feet high; while at the corners of the entablature stood four cressets. In the spandrels of the arch, two on either side, were trophies of flags supporting shields, on which were emblazoned in heraldic colours the arms of the City of Birmingham and the University.

Spanning the footpath on either side of the main arch were two subsidiary arches; the columns formed of 12-inch cast-iron gas main-pipes supporting cornices, on each of which were mounted the Royal Arms, blazoned in colours. The architrave on the side facing Colmore Row contained, in true Roman lettering copied from the Arch of Constantine in Rome, "Welcome to our King and Queen," and on the Victoria Square front the words "Welcome to Birmingham."

At night time the crown surmounting the arch was brilliantly illuminated in colours; while from the four cressets at the corners of the arch issued large gas-flares. The final design for the arch was executed by Mr. Charles Bardell, formerly a student at the Birmingham School of Art. The columns and timber framing were erected by the Gas Department; and the completion and embellishment of the arch was entrusted to Messrs. A. R. Dean and Sons, of Birmingham, who carried out the work in a really excellent manner.

The illumination of the Town Hall was also undertaken by the Gas Committee. The main device facing Victoria Square, "God Save the King," was a little over 100 feet long by 36 feet high, and contained 90,000 gas-jets—namely, 60,000 jets in the border and 30,000 in the device itself, the letters of which were 4 feet high. On the front of the hall facing Paradise Street was a huge crystal device of the City arms, 30 feet long by 24 feet high, which was illuminated by 1400 jets and 80 large flat-flame gas-burners. Facing Chamberlain Square was a profile of the King and Queen enclosed in a Brunswick Star, measuring 24 feet from point to point; the whole being surmounted by a Tudor crown, 8 feet in height, with the letters "E.R." on either side. The total number of jets in this device was 25,500. At each corner of the hall and the apex of the pediment at each end were large gas-flares. The main lines of the building and some of the columns were outlined in rows of jets. The length of tubing of all sizes used in the construction of the illuminations was nearly 2 miles. It will be admitted that the "life" given to gas illuminations by the waves of light from the jets renders the display very much more effective than the still white lines of light issuing from electric light illuminations.

The Gas Illumination of the Town Hall.

Paris Gas Supply Last Year.—According to the report presented by the Directors of the Paris Gas Company at the recent annual meeting of shareholders, the quantity of gas consumed in the twelve months ending Dec. 31 last—the first complete year of the new Company's existence—was 406,135,318 cubic metres, or rather more than 15,336½ million cubic feet, which was an increase of 4·23 per cent. on the consumption in 1907. The revenue for the twelve months was 75,660,086 frs. (£3,026,403), or 4·54 per cent. more than the preceding year. A dividend was declared at the rate of 12·50 frs. per share (250 frs.). The share of the year's profits handed over to the Municipality was 22,571,067 frs. (£902,843).

UTILIZATION OF TAR FOR HEATING.

In the account of the proceedings at the recent congress of the Société Technique du Gaz en France which appeared in the "Journal" for the 29th ult., it was mentioned that the address of the President (M. Godinet) was devoted mainly to the subject of the utilization of tar for heating purposes. The full text of the address has since been published, and from it the following portions have been translated.

In considering the question of the use of tar as a fuel in gas-works, it must be borne in mind that present-day conditions are very different from those obtaining when means did not exist for using either coke or tar as a fuel, when the colour maker did not employ tar as a raw material, and when but little tar was used for the manufacture of pitch. At this period, the furnaces were those of the open type, and the best of them, in the large works, used 200 to 250 kilos. of coke for the distillation of 1 metric ton of coal; while in smaller works, the quantity would be 250 kilos., and in still smaller ones from 300 to 350 kilos. would be used per ton when the retorts were heated by small furnaces. In the case of an over-supply of tar, which owing to the comparatively small demand could not be sold, it had to be used as fuel in place of coke; and this was done in the most primitive way by allowing the tar to flow into the furnace in a thin stream. While the supply in this way was not difficult, gas makers were satisfied if they did not use a greater weight of tar than of coke. It is probable that usually the tar was neither measured nor weighed; the gas maker being content to take steps to make some use of it.

At a later period, when the qualities of fuels had become better known, tar became more saleable; and as that produced in gas making was not sufficient for the sole heating of the furnaces, some account was kept of the quantities used, and it may be taken that, with care, 100 kilos. of coke could be replaced by 80 kilos. of tar. With the rise of the aniline colour industry, and the use of tar products for creosoting railway sleepers, telegraph posts, &c., tars were purchased at good prices, which were maintained for a long period; and there were few gas-works which found it necessary to use tar as a fuel for the reason that they were too remote from a tar distillery. At this period—say forty years ago—the better heating of the gas-furnaces became more common. The direct-combustion furnaces, working with from 50 to 100 per cent. excess of air, were replaced by recuperative furnaces; and subsequent to this change it has been practically an easy matter to limit the supply of the secondary air to less than 5 per cent.—the latter, moreover, taking to the recuperative chambers part of the heat not used in the furnace. The example thus set by the large works was followed in the case of smaller plants; so that the recuperative principle may be said to be now in universal use, even in small installations. As the recuperator allowed of the consumption of coke being reduced by about 25 to 30 per cent., no more was heard for the time of the use of tar as a fuel, except in certain very special and rare instances.

A glance back over the communications to the Société Technique from 1874 to the present time shows that there was one paper on the subject in 1877, a second in 1883, four in 1886, a seventh in 1889, and an eighth in 1890; the next revival of the subject being by M. Échinard last year.* The use of tar for this purpose is a natural result of its steadily falling price—viz., in the course of thirty years from 60 frs. or 70 frs. to 30 frs. or even 25 frs. per metric ton. Over-production is the cause of this drop, and is itself due to the construction of late years of many metallurgical furnaces using coke on the recuperative principle. It will thus be seen that a rise in the price of tar is a very unlikely thing; while transport charges for tar and returned empties have led the gas maker to consider the importance of using this material as a fuel.

Despite the many papers upon the subject, it may be said that the use of tar as fuel is still hampered by a number of difficulties. M. Mallet has found that no trouble attends the burning of tar, but there are many obstacles still to be surmounted in consuming it in such a way that heat is developed about equal to that which is obtained per ton distilled when coke is used as the fuel in a recuperative furnace. While it is quite easy to replace by a less weight of tar the 20 or 22 kilos. of coke employed in an ordinary setting of seven retorts for distilling 100 kilos. of coal, it is not the same when the attempt is made to replace, also by tar, the 12 to 14 kilos. of coke used in a recuperative furnace distilling the same quantity of coal in eight or nine retorts. M. Mallet, at the conclusion of his paper last year, placed the heating power of tar at 10,500 calories, which is nearly one-and-a-half times that of coke (7500 calories)—a difference which should allow of much better results being obtained.

Unfortunately, my colleagues and I are unable to announce that we have designed a perfect furnace for the use of tar—that is to say, one to be compared with the recuperative coke furnace. Press of other matters engaging our attention, we have continued the use in one of our gas-works of the furnace supplied with tar described by M. Échinard last year. This furnace, it will be remembered, was one originally built for eight retorts, two of which were removed in order to make room for a combustion chamber large enough to enable the materials used to withstand the powerful heat developed by the combustion of the tar. After heating and filtering, the tar is delivered in a thin stream into the chamber, where it is burnt partly by the outside air passing through the spaces in the brickwork, and partly by the warm air coming away from the recuperators. The delivery is regulated by water displacement, and the tar itself emerges from an aperture in a thin plate.

The quantities consumed were found to vary to a considerable extent; and in the course of our experiments no great benefit was found in reducing the quantity of air from the outside and increasing that coming from the recuperators. The results obtained remained practically the same until we gave up the method of admitting the tar in a stream, and introduced the system of injecting it as a spray. The latter is not a novel procedure; MM. Lemerle, Dauge, Drory, and Hovine having already drawn attention to it as far back as 1886. We have not seen or used the apparatus employed by them, nor have we even been aware that such methods were being employed. Further modification consisted in taking only a fraction of the air supplied through the brickwork of the furnace; the remainder being drawn from the recuperators, and entering the combustion chamber at points throughout the length of each side. The results of these trials were most encourging. If they did not give the greater economy expected, they nevertheless showed that combustion was absolutely complete, and that the furnace, retaining a regular high temperature, possessed the greatest latitude in use. Distillation could be done either in six or four hours, or even 3 hrs. 25 mins. But the drawback was that with this six-retort furnace the average weight of tar amounted to about 14 per cent. of the coal distilled. We therefore made similar experiments with one of eight retorts; a furnace already in use being taken for the purpose, and the combustion chamber being placed in the centre between the recuperative chambers. In doing this it was hoped that the power of the furnace would be increased by one-third—that is to say, that the eight retorts would be heated with the consumption of tar already found necessary for six. It was hoped that if 4800 kilos. of coal distilled in six retorts required 14 per cent. of its weight of tar (say, 670 kilos.), this same quantity would serve to distil 6400 kilos. distributed in eight retorts—the result representing a proportion of tar of $10\frac{1}{2}$ per cent. Such a result assumes the heat developed by coke to have a notable advantage over that of tar. Reckoning that the respective calorific powers are 10,500 and 7000, we should have had for the distillation of 100 kilos. of coal: With 14 per cent. of coke, at 7000 calories, 98,000 calories; with $10\frac{1}{2}$ per cent. of tar, at 10,500 calories, 110,250 calories—say, 13 per cent. more. As I scarcely hoped to reduce the tar below 12 per cent., we may put the result thus: 12 kilos. × 10,500 calories = 126,000 calories—a development of heat which exceeds by 28 per cent. that obtained with coke.

This anomaly may be due to improper adjustment of the air used for the combustion of the tar, to irregularities in the supply of the latter, to formation of aqueous vapour from the hydrogen contained in the hydrocarbons of the tar, to water from the injector, or to an increased figure for the calorific power of the tar. In attempting to clear up this point, it was seen that in all the papers on heating by tar the figures given for heating power vary from 10,500 to 11,000 calories, while elsewhere the values given are invariably lower—10,000, 9500, and even 8900 calories; the last figure being given in the "Aide-Memoire sur l'Electricité," by MM. Hospitalier and Roux. In the "Traité de Fabrication du Gaz," by M. Borias (1890 edition, p. 92), there is a table by Würtz giving the composition of tar as 0·58 carbon, 0·19 hydrogen, and 0·23 ash or other constituents—probably oxygen, nitrogen, and moisture. The heating power is put at 10,758 calories; while that of coke, of the composition of 0·85 carbon and 0·15 ash and other matter, is given at 6000 calories. Starting from these data, it is possible to arrive at a theoretical value of the calorific power of tar. One kilogramme of tar containing 0·580 kilo. of carbon, in combining with 1·546 kilos. of oxygen, will give 2·126 kilos. of carbonic acid, producing 4717 calories. Similarly, 0·19 kilo. of hydrogen combines with 1·52 kilos. of water and produces 5529 calories. The combustion of the kilogramme of tar thus gives rise to 10,246 calories, making no allowance for condensation of steam. In the case of coke, 0·85 kilo. of carbon, by its combination with 2·226 kilos. of oxygen, gives 3·116 kilos. of carbon dioxide, and produces 6746 calories.

It seemed worth while to ascertain if the heat produced by these combustibles is able to raise the respective products of combustion to equal temperatures. The oxygen being employed as air containing 23 per cent. of oxygen and 77 per cent. of nitrogen, it will be seen that, in order to effect the combustion of the tar, 3·066 kilos. of oxygen and 10·264 kilos. of nitrogen (= 13·330 kilos. of air) are introduced. In the case of coke, we must also add 7·586 kilos. of nitrogen to the 2·226 kilos. of oxygen—that is to say, the air required for the combustion is 9852 kilos. The products of the combustion of the tar are therefore—

	Kilos.
Carbon dioxide	2·126
Water vapour	1·710
Nitrogen	10·264
Oxygen, nitrogen, &c., not included in the calculation	0·230
Total	14·330

In the case of coke, the figures are—

	Kilos
Carbon dioxide	3·116
Nitrogen	7·586
Total	10·702

* See "Journal," Vol. CIII., p. 39.

The theoretical temperature of the products of combustion is obtained by dividing the heat produced by the weight of the products of combustion multiplied by the mean specific heat of each. I have found it is 2648° C. in the case of tar, and 2672° C. in that of coke. We may come to a sufficiently near approximation to the truth by supposing *a priori* that the temperatures of the combustion will be in the neighbourhood of 1800° C., and then introducing into the calculation the mean specific heats between 0° C. and 1800° C. According to the papers of Herr Schaefer on the values of specific heats at different temperatures, it is possible to calculate that in the case of the permanent gases the specific heat at 1800° C. is 1·32 times that at 0° C., that in the case of water vapour this factor is 2·34, and in the case of carbon dioxide 2·54. The specific heats are thus as follows:—

	At 0° C.	At 1800° C.	Mean.
Carbon dioxide	0·217	0·551	0·384
Water vapour	0·477	1·068	0·772
Nitrogen	0·244	0·322	0·283
Oxygen	0·218	0·287	0·252

Employing these numbers in the calculation, and assuming that the 230 grammes of non-combustible matter in the tar is composed of equal parts of oxygen, nitrogen, and water, it is found that the specific heat between 0° and 1800° of the products of combustion of 1 kilo. of tar is 0·359. Making the same calculation for the products of the combustion of coke, we obtain as the mean specific heat 0·312. The theoretical temperatures of these combustion products are therefore 1993° C. in the case of tar, and 2019° C. in the case of coke.

The error incurred by assuming, as has been done, that the temperatures are in the neighbourhood of 1800° C. is thus within 10 per cent., and is therefore more apparent than real, since we are dealing with theoretical temperatures which are not attained in actual practice.

The results thus obtained show clearly that the heat produced from a tar of this composition should be not in the least inferior to that obtained from coke, and that discrepancies which may arise in practice must come from the less perfect combustion of the tar. It is therefore of advantage to examine the manner in which the tar is employed. It may be noted, first of all, that the foregoing calculation as to the combustion of coke applies only to its theoretical combustion—that is to say, without excess of air either in a direct-combustion furnace or in one of the secondary type in which no water or steam is injected into the furnace, and in which no recuperation of the air supply is employed. Now, all our furnaces have the great advantage of a supply of superheated steam from the recuperators, which, apart from the quantity of heat thus brought into the furnace, appreciably reduces the quantity of the primary air supply, and increases in like proportion the secondary air, which is strongly heated in the recuperating chambers. Thus in practice our furnaces receive from 0·5 to 1 kilo. of steam per kilogramme of coke. In introducing only 0·5 kilo. at 200° C., we introduce into the furnace 50 calories; the water having the effect of reducing the supply of primary air needed from 4·925 to 4·7 kilos., and increasing the secondary air supply from 4·925 to 5·15 kilos. Now, if these 5·15 kilos. are heated to 750° C., they represent 965 calories, and with the 50 calories of steam there are 1·015 calories to be added to the 6746 calories produced by the combustion of the coke. We employed 7761 calories in order to heat the 10·7 kilos. of combustion products—say, 11·2 kilos., inclusive of the 0·5 kilo. of steam introduced. The mean specific heat of these products of combustion between 0° and 1800° C. is not modified very much. It varies from 0·312 only to 0·333; and the theoretical temperature combustion of the coke is thus 2080° C. But with tar also we heat in our furnace, if not the whole, at any rate a good half of the air supply; and owing to this fact, we thus bring into the furnace about 6·665 kilos. of air at 750° C.—say, 1250 calories. The mean specific gravity of these products of combustion has not varied; and the temperature of combustion rises and becomes 2230 C.—that is to say, in these conditions tar should surpass coke.

In thus seeking for an explanation of the inferiority of the tar, the question arises as to whether the air supply is not badly adjusted to it, and is not most frequently in excess; yet the air is regulated in precisely the same way as with coke. The secondary air supply is cut down until it is seen by the appearance of the flames in the recuperator that the gaseous fuel is not entirely burnt. Now, as it is easier to see the smoky flame of tar than the colourless flame of carbon monoxide, it cannot be supposed that herein lies the cause of the disparity.

As to the adjustment of the tar, it is now found that though clean water under a constant pressure flows perfectly regularly through an aperture in a thin plate, tar does not do the same in like circumstances. The amount delivered varies from hour to hour to an extent of from 10 to 15 per cent. As a result, if the air supply is so adjusted that no smoke is seen at the time the supply is greatest, when the supply of tar drops off there will be excess of air. This is due to the viscosity of the tar, and to the too large surface of the vessel, having a partition (cut away at the bottom) used to contain it, and employed to effect its supply by entrance of water into one compartment of the apparatus. Regularity of supply is improved by the use of a receptacle closed on the top, and provided with a delivery-tube for the water, as well as with two tubes dipping into the vessel—one for the introduction the other for the removal of the tar—there being also a tube for the outlet of water. The apparatus is provided with cocks on the water outlet and on the inlet and outlet of the tar, in order to control as easily as possible the quantity burnt in the furnace. The tar passes from a graduated tank, and the workmen in filling it will note, when opening and closing the tar-cocks, the respective marks on the tank. In this way an exact measurement is made. The small closed reservoir is large enough to allow of it being refilled only twice in the 24 hours. The supply of the tar is altered very simply by adjusting the level of the water by a device in which the constant-level vessel has a height sufficient for the purpose, while the float which controls the cock of the water-inlet is attached to the lever of the latter by a set-screw; the latter being fixed to its rod at the height which will give the water level required.

The chief cause of the inferiority of tar to coke is the steam which enters the furnace with the former from the injector. Makers of injectors put the proportion of steam at 1 kilo. per kilogramme of tar; but I have found that 1·5 kilos. is an average proportion. This increases the weight of the products of combustion which have to be drawn off, and lowers the temperature. Taking the weight-for-weight figure of 1 kilo., we get for the mean specific heat the value 0·385, while the theoretical temperature of combustion, when recuperation is employed, works out to 1940°. In the case of a steam supply at the injector of 1·5 kilos., the temperature will be 1820°. The present temperature being 2230°, it is seen that the reduction in temperature due to the injection of the 1 kilo. of steam is considerable (15 per cent.), and gives a result inferior to that with coke where the temperature is 2080°. The moral is that, in using an injector for tar, the method should be either to employ the minimum proportion of high-pressure steam and to take all advantage possible of recuperation, or to adopt hot air under pressure as a means of injection.

As regards the practical results obtained, the observations of a furnace have shown that in the course of a little more than a month the quantity of tar used per 100 kilos. of coal was 11·7 kilos.—a result which was obtained despite the fact that the make had to be modified several times, and that on other occasions the supply of the tar was not altogether satisfactory. It is thus seen that by using one fuel for the other we replaced 14 kilos. of coke at 6746 calories (= 94,444 calories) by 11·7 kilos. of tar at 10,246 calories (= 119,878 calories)—that is to say, a gain of 26 per cent. These results, in comparison with those published by other experimenters, proving somewhat disappointing, reference was made to works by chemical authorities, not for the confirmation, but for the contradiction of the figures upon which my calculations had been based. I took the table of the constituents of coal tar given by Schilling in the edition translated into French by Servier (2nd ed., p. 223), as a result of an arithmetical analysis of which it may be stated that in the case of the organic acids and bases in coal tar the proportion of carbon varies from 69 to 84 per cent., while that of hydrogen is from 6·5 to 15 per cent.; these compounds making up about 5 per cent. of the tar. The light oils and hydrocarbons, also representing no more than 5 per cent. of the tar, contain from 83 to 91 per cent. of carbon, and from 17 to 9 per cent. of hydrogen. The heavy oils, naphthalene, and anthracene compounds, forming about 30 per cent. of the tar, contain 92 to 95 per cent. of carbon, and 5 to 8 per cent. of hydrogen. All these bodies are thus richer in carbon than is indicated by the figures of M. Borias, cited by Würtz; and it is seen that their percentage of carbon drops as their boiling-point rises, which leads one to conclude that the pitch and the mixture of heavier oils are still richer in carbon. These considerations show that the average proportion of carbon in tar will never fall below 85 per cent., while that of the hydrogen will not exceed 8 per cent. The heating power of such a tar will not exceed 9000 calories, making no allowance for condensation of steam.

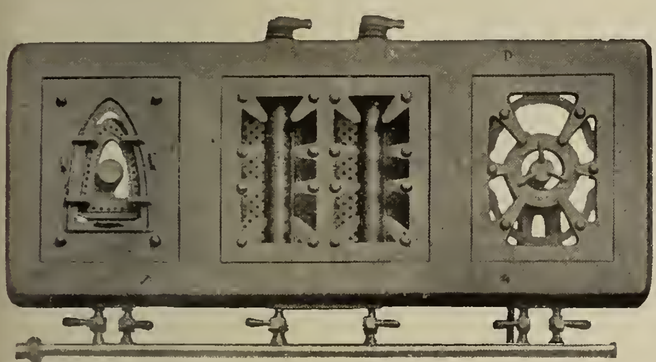
Some further data as to the calorific power of tar, which confirm the above conclusions, have been found in the papers of Mahler and Euchène. The figures given by the former refer to Commentry coal. The tar has the average composition of 88·6 per cent. of carbon, 5·2 per cent. of hydrogen, and 6·3 per cent. of oxygen and nitrogen. Its gross calorific power is actually observed to be 800 calories; while the theoretical figure obtained by a very simple formula indicated by him is 8810 calories. These values, however, include the latent heat of steam; and therefore, to render them comparable with the figures already given, they should be reduced to 8530 calories. M. Euchène has given for the tars of five different coals the following percentage composition: Carbon, 86; hydrogen, 6; oxygen and nitrogen, 8. The heating power of such tar, according to M. Mahler's formula, is 8512 calories. It must be mentioned that the tars just referred to are probably pure, while those used by the gasmaker as fuel contain 5 per cent. of water, due allowance for which, in accordance with Mahler's formula, further reduces the heating power to 7950 calories in the case of the Commentry coal, and to 7960 calories in that of the tars referred to by M. Euchène. These figures must therefore be placed against that of 6470 calories for coke containing 85 per cent. of carbon. It therefore follows that, in future comparisons of the calorific values of fuels, we should take the net heating power of tar at 8000 calories, or the gross value at 8300 calories. It will thus be seen that, in substituting tar for coke, we may take as a basis that 14 kilos. of coke at 6470 calories (= 90,580 calories) may be replaced by 11·7 kilos. of tar at 8000 calories (= 93,600 calories).

This shows very clearly that the furnace to which water vapour gains access from the injector is actually better managed than the coke-furnaces to which a lesser degree of care is given, and the consumption in which can be further decreased by proper

attention. The figures also make it very clear that, under present conditions, it is difficult in practice, in a furnace heated by tar to consume less than 80 per cent. of the coke which would be used were this description of fuel being employed. It used to be said years ago that it was possible to reduce the weight of the tar to 50 per cent. of that of the coke by causing the whole of the air needed for the combustion of the tar to come from the recuperators; while in the case of coke this quantity of air was very little more than half the air needed. But the combustion of tar containing 86 per cent. of carbon and 6 per cent. of hydrogen requires 12·1 kilos. of air, which, if heated to 1000° C., supplies the furnace with only 3000 calories; making a total, with the 8000 calories from the tar, of 11,000 calories. Therefore, to use tar in the proportion suggested, it would be necessary that the hot air should bring into the furnace as much heat as the tar itself—a condition of things which is obviously impossible.

PORTABLE GAS-COOKER AND WATER-HEATER.

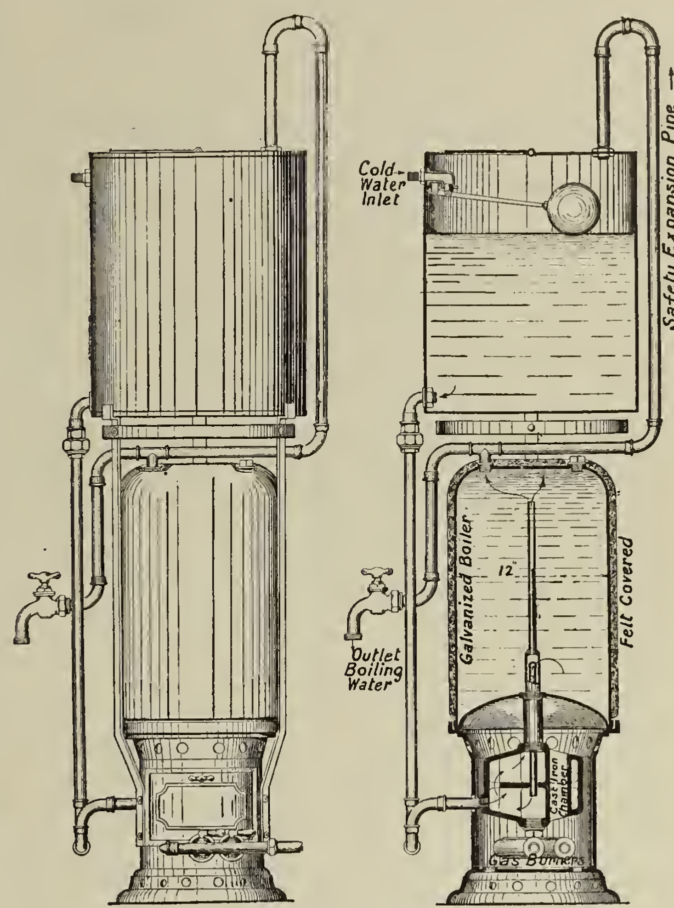
The first two of the accompanying illustrations show a type of gas-cooker which the Primitiva Gas and Electric Lighting Company of Buenos Ayres have successfully introduced among their small consumers. They were sent by Mr. Bernard F. Browne, the Company's Engineer and Manager, who says he considers the stove to be well suited for this class of consumer, owing to its inexpensiveness and portability. Another recommmendation is that it can be easily taken to pieces and cleaned. There is no paint upon the stove; the only finish being black lead. This particular model is made for the Company by the Forth and Clyde and Sunnyside Iron Company.



View of Hot Plate.

Front View.

Mr. Browne also sends illustrations of an inexpensive water-heater which is made up in Buenos Ayres for use in restaurants and tea-shops. It is constructed on similar lines to an ordinary house hot-water installation, and, owing to the arrangement of the circulating system, boiling water is obtainable almost immediately after the gas is lighted. Mr. Browne points out that



A Gas Water-Heater.

the heater is neither handsome nor decorative; but he says it has proved itself to be almost entirely "foolproof."

The South Metropolitan Co-Partnership Bonus.

The announcement is made that the bonus earned by the South Metropolitan Gas Company's workmen for the last twelve months will be at the rate of 7½ per cent. on all salaries and wages. This is equivalent in money to £37,500, or sufficient, if all is invested in the Company's stock, to increase the employees' shareholding in the Company to the substantial figure of £264,000. In stating these facts in the current issue of the "Co-Partnership Journal," Mr. Charles Carpenter, the Chairman of the Company, remarks:

It must not be overlooked that the foundation upon which co-partnership has been laid is shareholding. It is the recognition of this fact which has now for our late Chairman's scheme the success it retains undiminished in its twentieth year. I have said that the bonus is declared at 7½ per cent.; but, unless the unforeseen happens, it will certainly be higher next year, since the Directors have already decided to reduce the price of gas, and this is the one determining factor in settling the bonus percentage. I should dearly like to see this rise again to 9¾ per cent.—the figure at which it stood when the selling price of gas was 2s. per 1000 cubic feet; and the wish is not by any means a hopeless one. Much can be done by our more than 5000 co-partners in promoting the use of gas and coke. We may with confidence look back during the first half year we have been without the counsel of our ever-to-be-remembered friend Sir George, and say in the words chosen by East Greenwich to perpetuate his memory, "*Fervet Opus*"—the work goes on with spirit.

At the last meeting of the Metropolitan Water Board, Mr. S. Marsland, Senior Assistant-Engineer, was appointed Assistant District Engineer of the Kent district, to fill the vacancy caused by the retirement of Mr. W. Morris, and the consequent promotion of Mr. F. Melhuish to the position of District Engineer.

According to the recent report of the Board of Trade on their proceedings under the Electric Lighting Acts, 1882 to 1902, during the past year, the number of Provisional Orders and Licences granted prior to the present session was 1108—viz., 1075 of the former and 33 of the latter. Of the Orders made, 1058 were confirmed by Parliament; but 283 of them, and all the Licences, have since been revoked or rejected, or have expired.

At the recent annual meeting of the Provincial Grand Lodge of Kentish Freemasons, held at the Central Hall, Chatham, under the banner of the "Royal Kent Lodge of Antiquity," No. 20, W.Bro. Joseph Davis, the Engineer and General Manager of the Gravesend Gaslight Company, was appointed Provincial Grand Superintendent of Works. Bro. Davis is a Mason of some 18 years' standing, and is P.M. of his Mother Lodge, "Freedom," No. 77, Kent. He has also passed the chairs in the Mark degree, and the Royal Ark Mariners. In addition to this, he is a Founder, and at present Treasurer, of the "William Russell" Lodge, No. 3103.

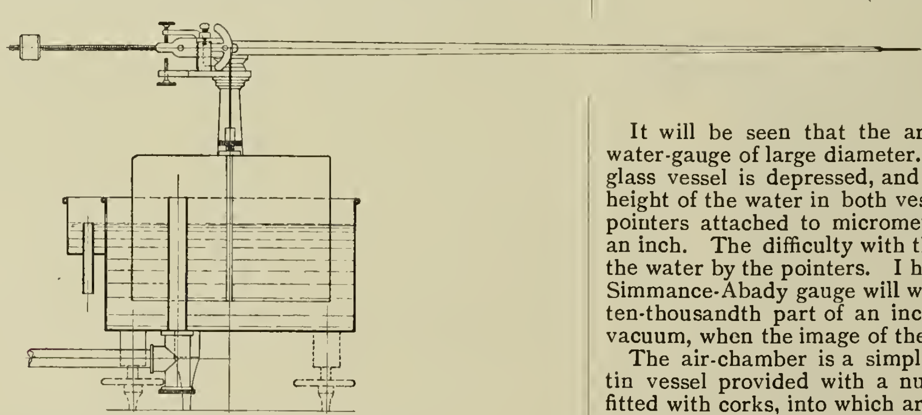
DESIGN OF ATMOSPHERIC BURNERS.

By Alfred Mansfield, of Liverpool.

One frequently sees references made to the amount of primary air injected by atmospheric gas-burners. Definite statements are made of the proportions of air to gas; but the method of measuring the volumes is not described. For some years I have been engaged in investigations connected with atmospheric burners of all descriptions, and have had at my disposal a laboratory fitted with every instrument necessary. My chief difficulty has been that I have not been able to obtain instruments which would measure minute pressures; and I was not confident that I could supply air at atmospheric pressure while it was being measured. I am now the happy possessor of a gauge that will record pressures, which I had hitherto thought to be impossible. The object of this communication is to describe this gauge, and the method of using it, in the hope that others will find it of service.

To test atmospheric burners, it is obvious that arrangements must first be made to supply gas and air in such a manner that both can be measured accurately, either by meters or graduated holders. All the instruments for this purpose are readily available. Then some kind of closed chamber must be provided, into which the burner to be tested is fixed, so that the air-holes through which the primary air is aspirated are inside this chamber. The sole source of supply of air is then through the measuring instruments in this chamber. This is all very simple. But the air must be supplied at atmospheric pressure; and this is where the difficulty arises. If the pressure in the air-chamber is above or below atmospheric pressure, results will be obtained which are very unsatisfactory. The injection of air and the illuminating power of the mantle will vary as much as 25 per cent., with an increase or decrease in pressure of air in the air-chamber, which cannot be noticed on any ordinary gauge. It is, therefore, absolutely essential to have a gauge attached to the air-chamber of the greatest sensitiveness. It is also important that the gauge should be fixed in such a manner as to be read with the greatest facility during a test.

I tried every method I have seen described or had suggested to me, without success. The idea which looked the most promising was one suggested by a German scientist who used tobacco smoke as a gauge. A glass tube was inserted in the side of the air-chamber, into which tobacco smoke was puffed. The idea was that if the air inside the air-chamber was at atmospheric pressure, the tobacco smoke would be balanced in the glass tube, and neither enter the chamber nor be blown out. I persevered with this for a considerable time, but could never get two readings alike—either of the air injected or the candle power of the light. When I was becoming desperate, I was fortunate in enlisting the practical sympathy of Mr. Simmance, coupled with the vigorous and refreshing criticism of Mr. Abady. Mr. Simmance, after much consideration, promised to make a gauge for me which would read to a minuteness hitherto unknown. He has kept his promise, and the result is shown in the sketch.

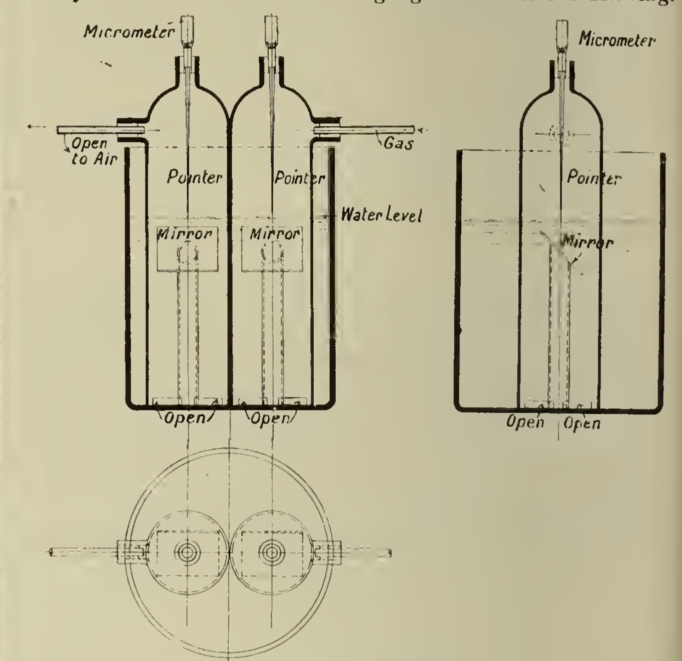


The Simmance-Abady Pressure-Gauge.
(One-Quarter Size.)

It will be seen to consist of a very delicately balanced gasholder bell, made of thin aluminium, suspended in a tank containing paraffin oil. Hanging from the centre of the bell is a piece of brass rod, which preserves its equilibrium. When a tube is connected from the inlet pipe of this gauge to any appliance—such as an air-chamber—in which air is confined, a pressure will raise the bell out of the oil and a vacuum will submerge it. The pressure recorded is the difference in weight between the sides of the aluminium bell, *plus* the brass rod, when submerged in paraffin oil and when suspended in air. The sensitiveness of the gauge is astonishing. A breath of air near the inlet pipe will send the pointer flying to its utmost limit.

It will be seen that the pointer is very long, so as to magnify the movement of the bell to facilitate reading. At first I attempted to take readings of the pointer on a metal scale, divided into hundredths of an inch. But constant reading of delicate scales does not improve one's eyesight; and even with the aid of powerful glasses, it was quite easy to read one-hundredth above or below. I therefore made use of an optical lantern, and threw an image of the end of the pointer on to a screen. On the screen itself I fixed a scale which I divided into linear inches. I carefully tested the scale on the screen for flatness of field, and convinced myself that the rise or fall of the bell was correctly indicated on the screen. I managed this by injecting minute quantities of air into the bell, by means of water measured in a burette, and marking each rise on the screen.

The next step was to try to find the value of each division of the scale on the screen in parts of an inch of water. I have a King's gauge which reads to one-hundredths of an inch. I have hitherto had implicit faith in this gauge, and have recorded pressures which I now know to be incorrect. I have seen eminent experimentalists reading this gauge to parts of one-hundredth of an inch with the greatest confidence. I now know that no King's gauge will read correctly to one-hundredth of an inch. It occurred to me that if I could make an ordinary water-gauge, of sufficient area to minimize capillarity, I could, by means of two pointers attached to micrometers, read the difference in the water-level of the two legs to the minutest fraction. I again consulted Mr. Simmance, and he thought this could be done; but he suggested that if a mirror was submerged in the water at an angle of 45°, the surface of the water could be viewed from underneath, and the pricking of the water by the pointers could be more readily observed. He made me a gauge similar to the drawing.



Micrometer Water-Gauge.
(One-Eighth Size.)

It will be seen that the arrangement is simply an ordinary water-gauge of large diameter. With pressure, the water in one glass vessel is depressed, and that in the other one rises. The height of the water in both vessels is measured by means of the pointers attached to micrometers which read to thousandths of an inch. The difficulty with this instrument is the attraction of the water by the pointers. I have been able to estimate that the Simmance-Abady gauge will with ease and accuracy read to the ten-thousandth part of an inch of water, for either pressure or vacuum, when the image of the pointer is thrown on the screen.

The air-chamber is a simple matter. It merely consists of a tin vessel provided with a number of holes. These holes are fitted with corks, into which are fitted the burner, gas supply, air supply, connection to the gauge, and a thermometer. I was afraid the heat radiated from the lighted burner might raise the temperature of the air inside the air-chamber, so I arranged a water-jacket round the air-chamber which is supplied with water at the temperature of the room.

On p. 103 is a sketch of the air-chamber; also general arrangement of the apparatus. The air is supplied from a gasholder which is very delicately balanced. The gas is carefully maintained at the desired pressure. The air-meter is ten times the capacity of the gas-meter.

In commencing a test, the gauge is disconnected from the air-chamber and carefully adjusted to a zero line midway on the screen, so that either pressure or vacuum will be recorded. When all is ready, the gauge is connected to the air-chamber; the gas is lighted at the burner to be tested; and air is admitted until the gauge stands at the zero or atmospheric line. Both meters are now revolving, and readings are taken which show the volumes of air and gas supplied. I find that a governor of the most delicate kind will not govern to such minute pressures; and it is better to correct any unevenness of the pressure by hand. I have a pinchcock on the rubber tube which supplies the air; and by screwing this slightly up or down, I can keep the pointer fixed on the zero mark, throughout a test, with great accuracy.

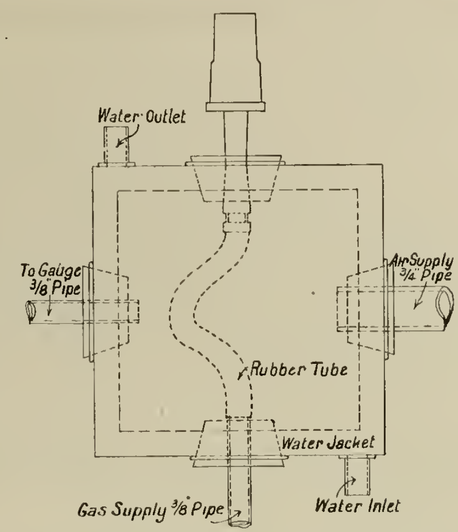
The results obtained with this apparatus are wonderfully consistent, both for quantity of air and illuminating power. A burner tested in free air and then in the chamber will give the same candle power.

It will be readily seen that the possession of such a set of instruments makes investigation of atmospheric burners much more simple. For instance, I suggest the following:—

1. The design, size, and position of the gas-jet.
2. The size and position of the primary-air inlet.
3. The diameter of the mixing-tube, and whether it should be a plain, straight tube, or constricted in any way.
4. The length of the mixing-tube.
5. The size and number of holes, slots, or other apertures at the point of ignition when it is desired to burn the gas in such a manner.
6. Calculations, based on theory, of the discharging power of orifices can be checked with the greatest accuracy.

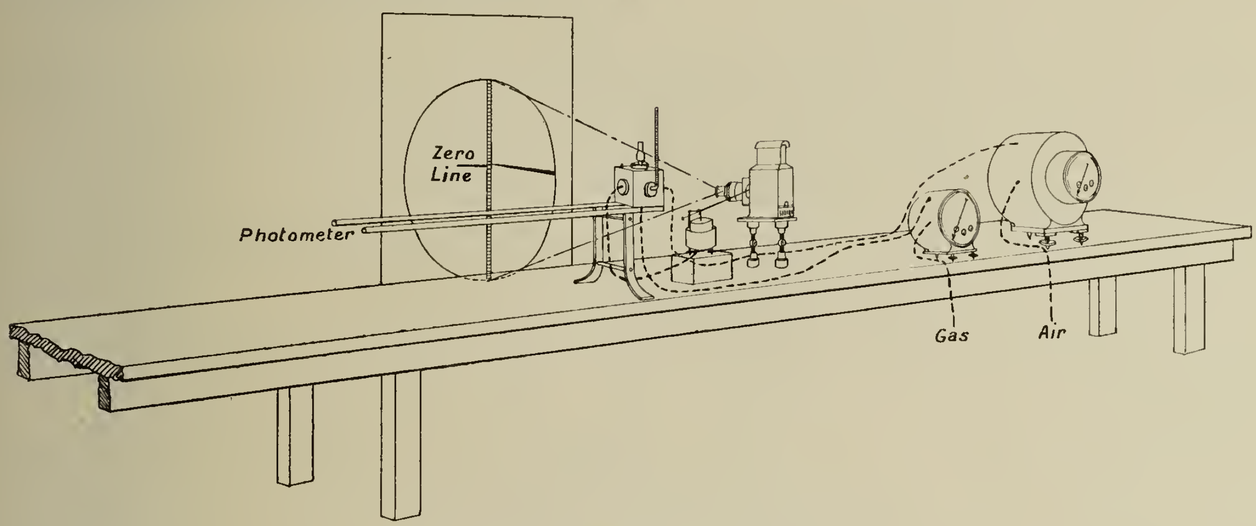
The influence of an extra supply of air may be gathered from a burner I tested, which injected at atmospheric pressure 4·5 parts of air to 1 of gas, and gave a duty of 17 candles per cubic foot of gas. I increased the air supply, by slightly increasing the pressure, to 4·73 parts of air to 1 of gas. The duty was then 23 candles per cubic foot of gas. I do not see why the same burner with a little alteration should not be made to inject this small extra proportion of air.

I am at present engaged on a long series of experiments, and hope to communicate some of the results as time goes on.



Air Chamber for Measuring the Air Injected by Atmospheric Burners.

(One-Quarter Size.)



The General Arrangement of the Apparatus.

REFLECTIONS ON CARBONIZATION.

II.

By Thomas Settle.

A better continuation of what has already been published from my pen there cannot be than to quote what Dr. Colman added in the discussion on Dr. Lessing's and Mr. J. F. Bell's papers at the Institution of Gas Engineers ("Journal," Vol. CVI., p. 860).

> This was the problem; and it would require a great deal of work before they could successfully solve it.

Not the least help towards considering Dr. Colman's two main points, and to hit the happy mean, will be to some extent in putting a few old sayings with a few new sayings; and in averaging these there might be found why ideas of carbonization at the present day are "in such a condition of flux" as the President (Mr. Thomas Glover) so aptly applied in his Inaugural Address. Nothing whatever is claimed by the writer other than being thankful for the opportunity to render a little assistance to Dr. Colman's "problem," and Professor Lewes's desire for "uniformity of action"—both so essential it would appear to the solution of ideal carbonization.

To form judgment at all, it is necessary the old sayings should be retold; and as they apply only as opinions at variance, the object of their use is, if possible, to bring out their hostility that is now apparently to end in a conference for peace on the subject of carbonization. What effect heat has on the distillation of coal, its effect on the gas produced from it, either by long travel or short, through coke and heat space, and the duration of the travel and contact, can best be judged by what is to follow. I am not at all events attempting to prove, as some do, that the slower vehicle can, and does, actually pass the faster one in front of it.

In Mr. Norton H. Humphrys's book, "The Chemistry of Illuminating Gas," published in the year 1891, the following will be found (p. 218):

> Careful investigation into the yield and quality of gas formed during successive periods of carbonization would afford a useful insight into these matters.

Professor Lewes, in the course of his lecture before the Irish Association of Gas Managers (Aug. 16, 1904), said:

> With the methods of retorting now in general vogue, however, anything even approaching uniformity is an utter impossibility.

Mr. W. H. Y. Webber, adding to the discussion, &c., says:

> The time had come when perhaps it would be an advantage to try to standardize some of their ideas of what was possible in the treatment of coal. Temperature as applied to carbonization is a great friend, and a bad enemy, in one breath—by making good stuff and sending it out impoverished in quality. It is almost a wonder that any temperature can stand what is said about it.

Mr. Thomas Newbigging, in his "Handbook," says:

> The permanent gas at its highest temperature does not probably exceed 135° Fahr., though generated in a heat usually reaching 2200° Fahr. The reason of the difference in the effect produced in the two instances given is explained by the fact of the rapid absorption of heat by the volatile constituents of the coal in assuming the gaseous form.

Mr. H. O'Connor, in his book, says:

> The gas leaving a retort freely has only a temperature of 222° to 330° Fahr., owing to the great absorption of heat on its assuming a gaseous form.

Mr. Lewis T. Wright:

> At the highest rate of distillation, 66 per cent. of the gas is evolved at 1339° Fahr.

The late Mr. W. Foulis:

The temperature of gas 18 inches from mouthpiece	890° to 518° Fahr.
" " " 12 feet " "	444° to 167° "
" " " 22 " " "	246° to 144° "

Professor Lewes (Irish Association lecture):

> The temperature of a charge in a sealed retort will be found to vary enormously in different parts of the retort. With an initial temperature of 1832° Fahr., the temperature of distillation will vary from about 1472° Fahr. close to the walls to about 752° Fahr. in the middle of the coal. So also when the gaseous products are distilled off they are subjected to a temperature of 6832° Fahr. at the sides of the retort, while above the charge they are probably only heated to 1112° Fahr.

Taking the above figures, no "uniformity of action" can be

claimed for, or found in, them, as, taking Mr. L. T. Wright's as 100 per cent.,

Mr. L. T. Wright is . . .	100 per cent. less	
Mr. Newbigging is . . .	90 ,, ,,	
Mr. O'Connor is	80 ,, ,,	
Mr. Foulis is	34 ,, ,,	at 18 inches from the mouthpiece.

Dr. Colman, in the discussion on Dr. Lessing's and Mr. J. F. Bell's papers, said ("JOURNAL" June 22, p. 859):

> They saw that the extent of decomposition of the volatile products must depend upon the manner in which the volatile products first formed, travelled onwards, and how they were subjected to heat in their travel. . . . They were also affected by traversing a free space, where such was present above the coal in the retort (and further) . . . there was no doubt variation in the manner in which the gas travelled through the coal or the coke after the first volatile products were produced and underwent decomposition.

Mr. Harold E. Copp, adding to the discussion (p. 863), said:

> He had found in the course of his investigations that illuminating power had some relationship to the temperature of the gas coming off, and the temperature was some measure of the extent of polymerization.

Mr. O'Connor's book:

> The production of the hydrocarbon compounds from the coal takes place at a comparatively low temperature. . . . When gas is being evolved from coal, the temperature of the retort is not even along the length of the retort.

In Mr. N. H. Humphrys' book (p. 216), we read:

> The gas at the front of the retort escapes directly, with scarcely any exposure to secondary action, and is further protected by being hurried forward by the gas from the other parts of the charge. Compare this with the action of the extreme back of the retort. Here the gas is generated in small quantity, and therefore occupies some time in moving forward. The rate of evolution of gas varies. It is evident that the time of exposure to secondary action varies still more widely. It would appear that in the ordinary 9-feet horizontal retort there is too much negative secondary action in the back part, and not sufficient positive action in front.

Professor Lewes's lecture, Irish Association.

> When the gaseous products are distilled off, they are subjected to a temperature of 1000° C. (1832° Fahr.) at the sides of the retort, while above the charge they are probably only heated to 600° C. (1112° Fahr.). This leads to the formation of two distinct sets of products in the tar—the first due to incomplete decomposition, and the second to the products of the decomposition being kept too long in the zone of heat.

The late Mr. Foulis:

> The more rapidly the coal is carbonized the better the results will be.

It seems from the above opinions that there is in them uniformity in agreeing that travel in space, through heat, and against heated surfaces, has a damaging effect on the gas as produced from coal in horizontal retorts.

In order to fix attention for conveying a meaning to explanations given later, it may be worth while here to give some figures of temperature affecting volume and illuminating power of the gas as generated in an actual test of a four-hours' charge carbonized in horizontal retorts. As in the case of tests previously given, the make, temperature, and illuminating power as recorded, are taken at 100 per cent., commencing and ending the first hour.

	Make.	Temperature.	Illuminating Power.
Commencement	..	.. 100 per cent.	.. 100 per cent.
End of first hour	100 per cent.	dropped 13 ,,	dropped 10 ,,
,, second ,,	34 ,,	,, 27 ,,	,, 20 ,,
,, third ,,	75 ,,	,, 40 ,,	,, 25 ,,
,, fourth ,,	92 ,,	,, 53 ,,	,, 50 ,,

Taking full consideration of the percentage of volume produced in the first two hours, and that practically no tar is formed during the first hour, there cannot be in this hour of "wet stage" carbonization anything like the decomposition that is attributed to the influence of heat and travel through space; and it may be that the answer to Dr. Colman's surprise in the amount of marsh gas produced in horizontal retorts begins with the second hour, when tar commences to come off and is "cracked up," as he says, "in the free space above the coal."

I have to set up now a most formidable opponent—one I have battled with—to the secondary action or decomposition of gas from the point of its generation to (say) the outlet of the mouthpiece. Before giving any account, I am not for the moment appearing either for the plaintiff or the defendant. Dr. Colman, in his remarks on the discussion of the papers read by Dr. Lessing and Mr. J. F. Bell, earnestly says:

> They must aim at the cracking up of the tars, just to the extent—they had to find out what it was—where the tar gave up its maximum quantity of carbon to the gas.

A perfectly new saying, which can with no less desire to see fulfilled be very well put with a few old sayings, in order to pass judgment on both.

Mr. Norton H. Humphrys, in his book (p. 217), asks:

> What is the period of exposure to secondary action that is needful for the best results?

And on p. 218:

> Once granted that a permanent gas is secured, the sooner that gas is removed away from the influence of temperature approaching anywhere near to that at which it was generated the better.
>
> A good permanent gas is not in any way benefited by exposure to secondary action.

The late Mr. William Foulis, in his Presidential Address to the Gas Institute in 1887, said:

> If coal were distilled at low temperatures and the gases afterwards subjected to greater heat in separate retorts where the heat could be accurately controlled, better results might accrue.

It is well within memory that the Dinsmore process was, to all intents and purposes, nothing more nor less than one of subjecting the crude gas—before the tar was separated from it—to that awful secondary action so full of destructive influences. Yet Mr. Carr, by his experiences and results, amplified all the "cracking-up of the tars" that Dr. Colman asks for.

The following is from "Newbigging's Handbook:"

> With one-third of the carbonizing plant at work, Mr. Carr produced about 10,000 cubic feet of gas per ton of an illuminating power equal to 19 standard candles, obtained from an inferior class of coal.

Without going into the merits of the process, they took the great precaution to only charge one retort at a time, evidently afraid of either "all heads" or "all tails" in the toss-up for supremacy in carbonizing methods slightly altered from those of the time of Murdoch.

Mr. Carr, I believe, was fully alive to the fact that the inlet temperature of the "duct"—the weapon for that resolute secondary attack—stood at about 1700° to 1800° Fahr., and the outlet at 1200° or 1300° Fahr.; so that, whatever passed in and came out all right, outlived and defeated Mr. Newbigging's highest temperature of 135° Fahr., Mr. O'Connor's average of 270°, Mr. L. T. Wright's (approximately correct) of 1339°, Mr. Foulis's 890° and Professor Lewes's average of about 1100°.

Professor Watson-Smith (see "JOURNAL," Vol. LV., p. 882), on "The Chemistry of the Dinsmore Process," said:

> He claimed an increase of 10 per cent. in quantity, also an increase in quality; while the yield of tar was reduced to about one-third, and its character entirely altered.

Professor Lewes, in his report on the Settle-Padfield process, Dec. 12, 1903, said:

> With regard to bye-products, the process yields as much coke as ordinary retorting, and of better quality; whilst the fact that all the tar is used in the process is a very small item at the present market price of this residual.

In regard to the tar, I think Professor Lewes might have followed Professor Watson-Smith's example and added "and its character entirely *gone*."

If all the theories advanced in regard to temperature, travel, and contact are right, how and where did Mr. Carr get his extra two or three candles? The two-thirds of the tar would not surely account for the 10 per cent. increase in volume, carrying also with it an increase of 10 per cent. in illuminating value. As previously stated, I make no attempt to prove or disprove. The verdict must be the reader's own.

The late Sir Edward Lawrence, who was for many years Chairman of the Liverpool Gas Company, and whose death, at the advanced age of 83, was recorded in the "JOURNAL" for the 8th ult. (p. 638), left estate of the value of £32,448 gross and £32,084 net.

Explosions in a gas-producer were traced to a cause not often suggested, at the plant of the Grand Rapids Hydraulic Company which was described in a paper recently read by Mr. James R. Fitzpatrick before the American Water-Works Association. The Company originally had a smaller producer-gas power plant than that described, and later increased it by the addition of a large new producer before the decision was made to replace the entire equipment. This required some changes in the old piping system, and after the change there were a number of minor explosions in the small producers when blowing-up the large one. This was caused, Mr. Fitzpatrick believes, by the fact that there was fire in the small producer, and that gas was blown over from the large producer through leaking valves. He therefore considers it advisable to test the valves twice each month.

Disagreeable tastes and odours were imparted last year to the water of the high-service reservoir at Holyoke (Mass.), by the micro-organism nitella, according to a report by the City Engineer, Mr. James L. Tighe. The plant was first discovered in the early summer growing in green tangled masses on the bottom and sides of the reservoir, except when the depth of water exceeded about 20 feet, and there was a luxuriant growth on the stone pavement of the dam. Nitella is a slender stem, ramifying into longer stems of about 2 feet, with eight needle-like branches growing in circlets spaced about 2 inches apart. It is not free-swimming. The odour of the plant resembles that of a skunk, and the water in which it grows, when drawn from the taps, smells like sulphuretted hydrogen. In the reservoir, no odour or taste was detected at or near the surface. In composition, the plant contains about 25 per cent. of lime, though the water in which it grows is comparatively free from this constituent. Analyses have shown its hardness to be not higher than 2·5 parts per 100,000.

THE RECENT EXAMINATION IN "GAS SUPPLY."

Answers to the Questions Put.

This is the second year of the examinations in "Gas Supply;" and the number of candidates who sat totalled 316, 81 of whom took the Honours grade, and 235 the Ordinary. This is an increase on the previous (*i.e.*, the first) year of no less than 125. Although it is but two years old, the number of candidates for these examinations actually exceeded slightly those in "Gas Engineering." The figures indicate that over 300 young men have, during the past winter, trained more or less systematically for the purpose of acquiring the diplomas which certify efficiency according to the standard which these examinations have set up. The fact that so many young men on the distributing staffs of gas undertakings are willing to undergo systematic technical study is more potent than the mere number of passes, or the percentage which they bear to the total number of candidates. Under the ordeal of a time-limit examination, many candidates fail to do themselves justice—being unable to correctly convey to paper an indication of their true technical worth in everyday practice.

The questions set at the recent examinations were more difficult than those of twelve months back. There appeared for the first time questions relating to curves of illumination; and it may be regarded, therefore, as a *sine quâ non* for candidates in future to be thoroughly posted up in illumination values at various angles. Mr. Gaster, when speaking on Mr. Forshaw's paper at the recent meeting of the Institution of Gas Engineers, said: "For comparison purposes, it is essential to know whether illumination measurements are taken horizontally, mean, spherically, or hemispherically." As a disciple of illuminating engineering, he attaches considerable importance to a knowledge of the illumination given off in all directions from all types of illuminants; and the apparent trend of the examinations in "Gas Supply" is to similarly attach greater importance to this phase of light distribution.

The report of the Council of the Institution informed us that the syllabus of the examinations had been revised, and intending future candidates will be well advised to closely follow the revised syllabus in their future studies. Last year, we printed a "model" set of answers to the questions then put, and accompanied them with some hints on the subject of examinations in general, and this one in particular. These articles appeared in our issues of July 7 and 14 last year, and will well repay perusal, both at the commencement of the winter session and (say) a week before the examination takes place, so that the points of advice may be kept well in mind. We have decided to again present a set of answers to the questions set this year.

Ordinary Grade Questions.

1. Describe the following: (*a*) ratchet stock, (*b*) venturi tube, (*c*) a well-constructed gas-cock, (*d*) one form of thermostat, (*e*) Forster pipe-joint. [*39 marks.*]

(*a*) A ratchet stock, as in fig. 1, consists of an outer casing A carrying, at the place where the handle C is inserted, a double pawl, made to engage for either screwing or unscrewing by the arm B. The dies D are secured by screws E. The ratchet stocks are chiefly used for screwing service-pipes *in situ.*

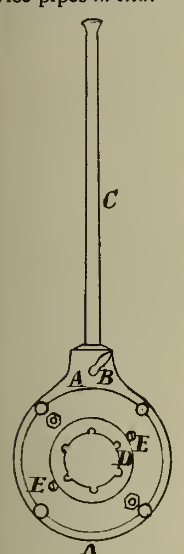


Fig. 1.

Fig. 2.

(*b*) A venturi tube is one which has a gradual contraction in some part of it, to accelerate the flow of a fluid passing through it. It is adapted to the incandescent gas-burner by several makers, a form of which is shown in fig. 2. It is here employed to accelerate and better mix the flow of gas and air, thus preventing back-firing. Venturi tubes have been similarly adapted to gas-fires.

(*c*) In the sketch fig. 3, A is the plug having a T-head, and B the barrel of the tap, which

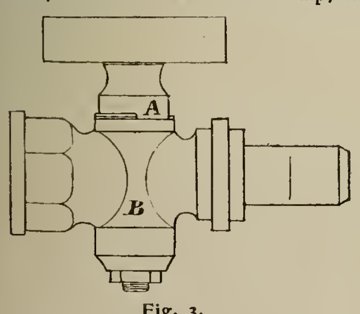


Fig. 3.

should be made of good quality gun-metal or brass. The bearing surface of the plug must be deep and well ground-in; the body being shaped to give sufficient lap when shut off to prevent leakage. The body and the plug should be absolutely free from sand holes, and the gas-way free from rough surfaces.

(*d*) A thermostat is a self-acting apparatus for regulating temperature. In practice, thermostatic valves are usually termed thermostats.

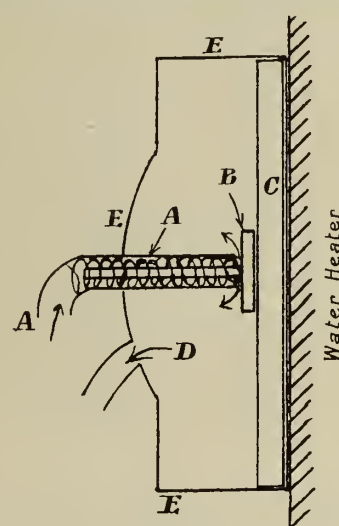


Fig. 4.

The thermostatic valve, as shown in the sketch, is fixed on the gas-supply pipe to a water circulator heater. A is the inlet gas tube, in which it will be seen is a spring pressing against a flat piece of metal B, which is guided by a rod passing up the tube A inside the spring. The sheet of thermostatic metal C, the front elevation of which is a square, lies against the casing or chamber E on that side which is placed against the water-heater; and E is kept in position by a copper band passing round the latter. As the water gets warmer, the metal C expands and lifts the plate B; thus diminishing the size of the gas-way. When the water cools, the metal C contracts and the spring presses back the plate B, allowing more gas to pass to the outlet D. In this way, the gas supply is regulated; and therefore the heat applied to the circulator is adjusted according to demands. It is usual, when a thermostatic valve is fixed to a heater, to either only govern the supply to one burner (if a double ring) or to provide a pilot for one of the lights, perchance the thermostat completely shuts off the supply of gas.

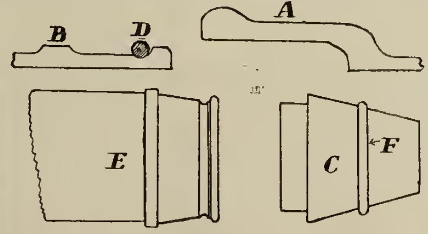


Fig. 5.

(*e*) In the sketch (fig. 8), A is a section of the socket wall of the Forster pipe, and B is a section of the spigot wall, E is an elevation of the spigot end, and C is a wood cone, one end of which fits into the spigot end of the pipe. Over this wood cone the rubber ring F is rolled into position in the groove on the spigot, as shown at D in section. The spigot is then forced into the socket of the preceding pipe by means of a pipe cramp, and the "Forster" joint is complete.

2. What are the advantages and disadvantages of gas and air adjusters as applied to (*a*) inverted incandescent gas-burners, and (*b*) gas-fires? What precautions should be taken in each case when installing inverted burners or gas-fires to ensure satisfaction in use to the consumer. [*39.*]

Gas and Air Adjusters Fixed to Inverted Burners.

Advantages: (*a*) Ensures as near as possible perfect mixture of gas and air to suit the requirements of the burner, (*b*) prevents sooting-up of burner and mantle, (*c*) saving in gas consumption if properly utilized, (*d*) ensures even distribution of flame on mantle, thereby getting best illuminating efficiency, (*e*) prevents roaring and hissing, (*f*) makes burner adaptable to any quality and pressure of gas, (*g*) guards against bad smell, evolution of unburnt gas, carbon monoxide, or other obnoxious gases.

Disadvantages: (A) Inexperienced persons may tamper with the adjusters and upset the mixture. (B) On badly-designed burners adjusters may get heated and corrode, in which state adjustment is difficult.

When fixing a burner, the gas and air adjusters must be examined thoroughly, and, if necessary, cleaned. The burner should then be screwed on to the pendant or bracket in a vertical position; the joint being made with a washer in preference to red or white lead. This done, the gas is ignited, and the adjusters are regulated to give a silent "dumpy" flame, which is egg-shaped, with a green inner cone. The adjusters are now secured (if there is a device provided to this end) and the consumer thoroughly instructed as to the use of same; being warned at the same time not to tamper unnecessarily with them. The gas is then extinguished, the mantle fixed, burned off, and relighted; note being taken that the illumination on the mantle is evenly distributed. Air-adjusters should be protected constructionally (in burner) from hot products of combustion.

Gas Fires.

Advantages.—(a^1) see (*a*), (b^1) prevents lighting-back, especially when used in conjunction with a venturi tube burner, (c^1) see (*c*), (d^1) ensures a long, silent flame which heats a large area of fuel (if unobstructed), (e^1) see (*e*), (f^1) see (*f*), (g^1) see (*g*), (h) increases radiation efficiency of gas burned.

Disadvantages.—(A^1) see (A), (B^1) in some types of fires the adjusters are fixed in such a position as renders them difficult of manipulation, (C^1) sooner out of order when dirty than burners *minus* regulators.

When fixing gas-fires, the adjusters should be examined and cleaned if necessary. The consumer should be instructed to notify the gas undertaking if further adjustment is subsequently necessary. The flame when adjusted must burn silently, with the two cones converging into one. The fuel must be cleaned and set so that the flames will pass up centre without obstruction; otherwise unburnt gas and carbon monoxide will be produced, resulting in bad smells. Also see that (1) the service-pipe is adequate; (2) the minimum pressure is 20-10ths; (3) a suitable flue is fixed. [See answer 7a.]

3. Describe fully the cycle of operations that takes place in the cylinder of an "Otto" type gas-engine. If gas-engine slowed-down and finally stopped, how would you proceed to locate the fault? *[39.]*

The "Otto" cycle of a gas-engine requires four strokes of the piston for completion. These strokes are known as: (1) induction, (2) compression, (3) explosion and expansion (or working stroke), (4) exhaust or expulsion.

The first outward stroke of the piston is the induction, the first inward stroke is the compression, the second outward stroke is the explosion and expansion, and the second inward stroke is the exhaust.

On the induction stroke, the charge of gas and air is drawn into the cylinder in proper proportions; and this is compressed on the compression stroke. At the highest point of compression the charge is ignited, and the piston is forced forward on the explosion stroke; and on the return (exhaust) stroke, the gases are expelled from the cylinder. The third stroke is really the one which performs the work, as sufficient energy is given to the fly-wheel to carry the piston over the other three strokes.

If engine slowed-down and finally stopped, the following should be examined in the order given:

(1) Supply of water to the jacket. If not running satisfactorily, the piston will be overheated.

(2) Supply of oil to cylinder. See if sufficient and of good quality.

(3) Bearings, especially of crank-shaft, for over-heating.

(4) Ascertain if engine is over-loaded.

(5) Ignition arrangements. See that igniter is not set too late.

(6) Valves. See if they are seating properly.

4. A series of empty rooms are each illuminated with (say) a 100-candle power inverted burner. The walls and ceiling of each room are papered or painted with one of the following colours: (*a*) yellow, (*b*) black, (*c*) brown, (*d*) blue, (*e*) white, (*f*) chocolate. State in each case what percentage of the rays of light falling upon the surface of the ceiling and walls will be reflected. What is the influence of dirt on reflection, and to what approximate extent would it affect the reflecting power of a yellow paper after five years' use in a residence situated in a manufacturing district? *[39.]*

The percentage of light reflected is—

White . . .	80	per cent. approx.
Yellow . . .	40	" "
Blue. . . .	25	" "
Brown . . .	13	" "
Chocolate . .	4	" "
Black . . .	·5	" "

The effect of dirt on a reflecting surface is to darken the reflector and so decrease the reflection according to the amount of deposit. Again, the particles of dirt sending back rays will refract them more than reflect.

The effect on the reflecting power of yellow paper after five years' use in a residence in a manufacturing district will be approximately to decrease it by 50 per cent.—*i.e.*, to 20 per cent. reflected.

5. Describe the construction of one form of (*a*) upright, and (*b*) inverted incandescent burner by means of which "lighting-back" is effectually overcome. What effect has "lighting-back" on the combustion of gas and its products? *[39.]*

The upright Welsbach-Kern burner consists of a gas-nipple perforated with (usually) three small holes to admit the gas from the bracket into the bunsen or venturi tube. This tube fits over the nipple, and is perforated with four holes to admit the primary air. The tube is about 4 inches in length, converging towards the centre and widening out towards the burner-head; the object being (1) to ensure thorough mixing of the gas and air, (2) to accelerate the velocity, and (3) to guard against lighting-back.

Fig. 6.

The top of the bunsen-tube opens into a circular chamber formed by an outer cone of that shape, the diameter of which gradually decreases to the point of ignition. Inside the cone, and concentric with it, is a similar device, with the exception that the latter is perforated with slits. A deflecting cone, as shown in the sketch, is fixed at the burner-head, to accelerate the speed of the mixture immediately before burning. A cog-wheel is formed round the top, into the centre of which fits the mantle-rod. This wheel is fixed so that the combustible mixture is caused to pass through the spaces between the cogs; thus giving it a circular motion on the mantle. There are really four devices for preventing lighting-back—viz., cog-wheel, cone deflector, perforated cone, and venturi tube.

In the inverted burner manufactured by the Bland Light Syndicate, the gas-nipple is screwed on the bracket or pendant, and is adjustable by a small screw. The air supply, which is also adjustable, is admitted through a series of holes set horizontally round the mixing-tube slightly above the gas-ejector. The mixing-tube is about 4 inches long, and inside is an arrangement to prevent lighting-back, as shown in the sketch. A metal shell is fixed across the top of the burner, to prevent the products of combustion from commingling with the primary air supply.

Fig. 7.

Lighting-back causes the flame to burn in a luminous state; the gas being ignited at the nipple owing to its being unable to obtain sufficient air for complete combustion. A bad smell is the result, and the mantle becomes sooted; carbon monoxide and hydrocarbon gases being produced.

6. Describe fully (*a*) the cause of drawn lead joints, (*b*) the method of preparing and the tests to be applied to a cement mortar for gas-main joints, and (*c*) the means you would adopt of demonstrating to a consumer that the pressure of gas at his meter inlet is always adequate for his requirements. *[39.]*

(*a*) The chief causes of drawn lead joints are: (1) Subsidence of the soil under the main by pit workings, salt mining, &c. (2) Vibration of the road produced by heavy traffic and by excavations near the mains. (3) A partial, though less common, cause is expansion and contraction of the metals due to change in temperature.

(*b*) A circular knife-edge pat of the cement is made up about $\frac{3}{8}$-inch thick in the centre, diminishing to $\frac{5}{16}$ths inch at the circumference and about 3 inches diameter. This is placed for 24 hours in a damp box having a flannel lid, and kept thoroughly moistened with water. The pat is then placed in a pan of cold water, raised to boiling point, and kept so for six hours. When the sample is examined microscopically, no crack should be seen. Another test is to pass the cement through a 180 sieve containing 32·400 holes per square inch, when no more than 3 per cent. should be left on the sieve.

(*c*) Assuming a consumer's service is $\frac{3}{4}$ inch, put on it a $\frac{3}{4}$ in. by $\frac{1}{8}$ in. T, and then reconnect the meter. Put a tap on the pipe from the $\frac{1}{8}$-inch connection and affix a recording pressure gauge, setting it to work for a day. On the following day, take off the chart and let the consumer compare it with a chart showing the distributing pressure in the district for the same period. If need be, a chart taken from the nearest lamp service will further confirm

7. (A) Why is fire-clay used for the fuel of gas-fires and for the lining of the back and sides? Which is usually the best method of connecting the flue-pipe of a gas-fire to a chimney constructed for use with a coal-fire, and what are the principles that determine such a form of connection? *[36.]*

Fire-clay is used for the fuel and linings of gas-fires because of its radiant and refractory properties. It is a good non-conductor and a ready absorbent of heat. It does not crack as readily as iron with sudden cooling, and the life of the fire is longer than it otherwise would be if fire-clay linings were not used, as these protect the metal framework.

The best method of connecting a flue from a gas-fire to a coal-grate chimney is shown in the sketch, fig. 8.

The front of the fire-place should be made up with sheet iron, in which holes are left for ventilation and for a flue-pipe to pass through. The flue should be connected to the fire by means of a round elbow, so as not to retard the flow of gases. The flue should extend up the chimney about 2 ft. 6 in., and should taper towards the top, so as to keep up the velocity of the gases. On the top of the flue should be placed a cowl to prevent down-draughts, and dirt and soot falling down the flue. The bottom of the cowl should be above the top of the flue, as shown in the sketch.

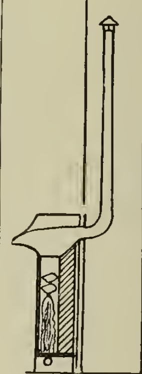


Fig. 8.

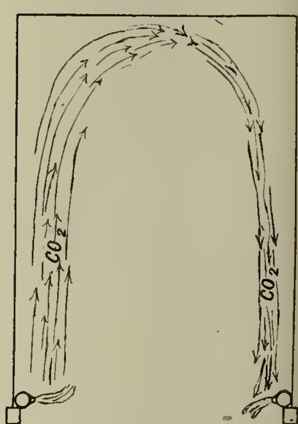


Fig. 8a.

or,

7. (B) What is the cause of oven burners "smothering" out? What means would you employ for ascertaining whether there was deficient or excess ventilation—*i.e.*, air passing through the oven? *[36.]*

Oven burners "smother" out when too little air is passing through the oven. Smothering is more frequently caused where the bunsens are arranged so as to get both primary and secondary air from inside the oven. Oxygen in the oven is gradually depleted, and as the deficient ventilation causes increasing accumulation of carbon dioxide, the atmosphere in the vicinity of the flames soon becomes a non-supporter of combustion, and the flames are extinguished. Sometimes the flames at one side are extinguished sooner than the other. This most frequently happens at the right side of the oven—*i.e.*, the side at which the supply of gas usually enters. The gas passes to the further point (the left side first), and the flames on that side are usually strongest if and when deficient ventilation is taking place. As a greater amount of heat is generated at that side, it induces sufficient oxygen to keep up combustion, and the carbon dioxide generated passes upwards, crosses to the right side, and, owing to the inefficient outlet at the top, passes down the right side, thus extinguishing the weaker flames at that point. See fig. 8A.

Deficient ventilation may be thus ascertained. Place a mirror under the stove in the position the drip tin occupies. Light the bunsens and close the door. If the supply of air is insufficient, the flames first become unsteady and then unduly elongated, with the ends tailing downwards. This may be avoided by reducing the gas supply to the point at which the ventilation will be efficient; but this will cause the oven to be longer in getting hot.

Excessive ventilation is hardly ever met with in practice. It would be indicated by observing the flames in the manner described above. In this case, the flame would not alter at all when the door was closed; whereas when the ventilation is right, the flames extend about $\frac{1}{4}$ inch on the door being closed. There appears, however, to be no precise research into the subject, though there is ample scope.

(*To be continued.*)

BOLZ VERTICAL RETORTS COMPARED WITH OTHER CARBONIZERS.

A paper by Herr Christian Bolz, the Manager of the Buda-Pesth Gas-Works, on the Economy of Vertical Retort Plant and a New System of Large Vertical Settings, was circulated as a pamphlet at the recent meeting of the German Association of Gas and Water Engineers at Frankfort. Not being, however, included in the programme of the proceedings, it was not read or discussed, though it would certainly have given rise to brisk and enlightening discussion.

The new system of settings referred to in the paper is that devised by Herr Bolz, of which one bed of twenty vertical retorts has now been in use at the Trieste Gas-Works for over a year. Some carbonizing results obtained with this bed of retorts were reported in the "Journal" for May 4 (page 292); and the following week illustrations and particulars of the system were given at length from the British Patent Specification. There is, however, a good deal of fresh matter in Herr Bolz's paper; and a summary of this is given in the sequel.

The unexampledly rapid introduction of vertical retorts into gas-works suggests that carbonization in such retorts or chambers is in the present position of the industry superior to other modes of carbonizing, and represents the most economical method of gas manufacture. In order to corroborate this impression, the author has placed alongside one another in a large table and a diagram the cost of installation and the working charges for various modern systems of retort-settings. All ordinary systems have been included; but it was necessary to omit the chamber carbonizers of Klönne, Koppers, Horn, and others, because information was not available as to the cost of their construction and working. The costs adopted in the tables have been carefully computed for average German conditions, so as to afford a fair and equitable comparison. The basis is in all cases an installation of a productive capacity of about 3½ million cubic feet per diem, or say 700 million cubic feet per annum. The chief items only, without the full explanatory details of the author's table, can be reproduced here (see Table I.).

It will be seen from this table that the Munich inclined chamber ovens are more costly to instal than Dessau vertical retorts for the same productive capacity, but that the latter cost more than inclined or horizontal retort-settings and plant. On the other hand, the Bolz vertical retorts are less costly than the Dessau verticals. It is further made clear what a great effect the cost of the plant has on the economy of manufacture. Thus if the capital expenditure exceeds a certain sum, the economy of the system is dubious unless it affords great saving in wages, repairing charges, &c. It is in this respect that the large carbonizing ovens, especially if inclined, are at fault, because for the same make they occupy more cubic space, and entail a considerably greater outlay on fire-brick and such materials. Thus about 48 cubic feet of carbonizing space is necessary with the Munich chambers per ton of coal carbonized in 24 hours, whereas with Dessau verticals 19 cubic feet suffices. The cubic space occupied by the producer and regenerator is about the same with the two systems; and the net result is that about 1·8 times as much fire-brick material is required in the Munich oven system as in the Dessau system of vertical retorts. The area of heated surface per ton of coal carbonized is 56·3 square feet with the Dessau verticals and 73·8 square feet with the Munich chambers. The fuel consumed in chamber settings rises in proportion to the size of the chambers. Central producers are from the technical and industrial standpoint not desirable. The various fittings or equipments are somewhat more costly for vertical retorts, but nevertheless the cost of installation of chamber ovens remains considerably higher. The economy of the ovens in respect of wages and power does not compensate for the increased capital outlay on them.

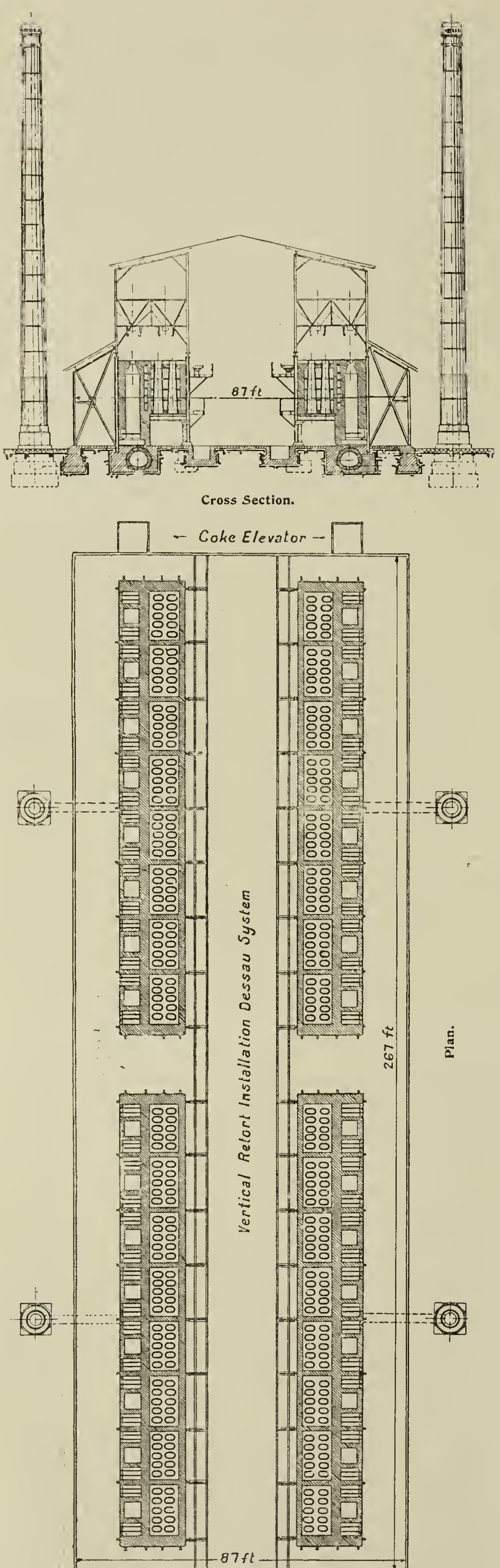
From the last line of the table, it will be seen that the retort-house costs of the manufacture of gas are about 17 per cent. lower with Dessau verticals than with either Munich chamber settings or the usual inclined or horizontal retorts. The chambers also do not afford gas of sufficiently uniform quality; for the calorific power of that evolved in the first three hours is more than double that of the gas of the last six hours. As the time of carbonization is 24 hours and the night-shift of men is dispensed with, this question of producing uniform gas with them becomes serious. It is not surprising, therefore, that vertical retorts have been much more widely adopted than chamber ovens.

If, however, the question whether the vertical retort-settings as now erected by the Dessau Vertical Retort Company constitute a system which cannot be improved upon industrially is considered, the answer must be in the negative, for the following reasons: (1) The producer is built alongside the retort-chamber, so that it can only be charged with cold coke. Its depth of nearly 23 feet is so great that only fork-loaded lump coke can be used, as the weight and depth of the bed of fuel causes breeze to choke the producer and to interfere with clinkering it. (2) Plant and power are required for storing and raising the cold screened coke for charging the producers. (3) The coke required for the producers, amounting to about 20 per cent. of the make, is taken out of the retort-house to no purpose and brought back again for use. Hence the cost of conveying coke is about 20 per cent. more than it need be. (4) At most, ten to twelve retorts can be placed in a bed. The ten-retort bed has only a productive capacity of 140,000 cubic feet per diem, which must be considered too low for the capacity of a unit in the large gas-works of to-day. (5) The cost of installation and the site required are relatively smaller as the size of the setting is increased; and the number of producers and the cost of clinkering them are reduced with an increase in the size of each setting. (6) A setting of greater capacity, the producers of which may be charged direct with hot coke from the retorts, should present great advantages over the Dessau setting.

The Bolz setting of vertical retorts, as erected at the Trieste gas-works, appears to the inventor to constitute a distinct improvement on the Dessau setting on all these six points. Some of the results obtained with it with English coal have already been published in "Il Gaz" ["Journal," Vol. CVI., p. 292], but trials have also been made by the staff of the German Association's Instructional and Experimental Works with coal from Ostrau in the Moravian-Silesian coal field, which is what is ordinarily

Table I.—*Comparative Cost of Gas Production by Different Modern Settings, for a Make of 3½ Million Cubic Feet per Diem, or 700 Million Cubic Feet per Annum.*

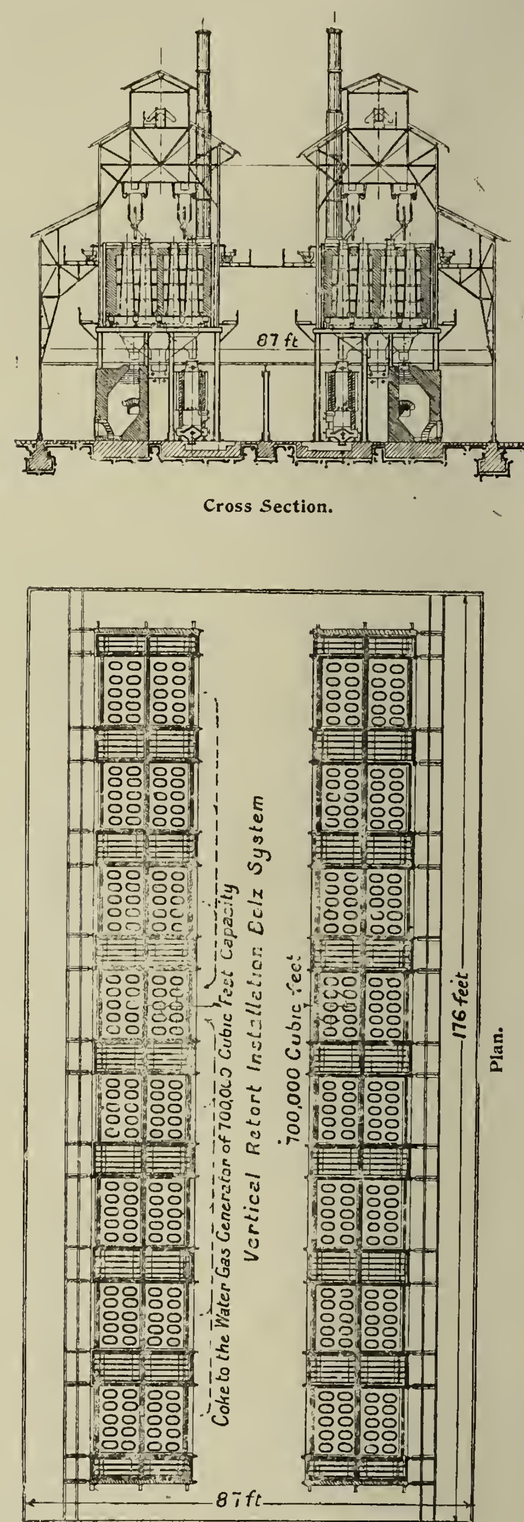
System.	Bolz's Settings of 20 Vertical Retorts, 13 Feet Long, with Producers beneath Stage. 12 Settings = 240 Retorts.	Dessau Settings of 10 Vertical Retorts, 13 Feet Long. 24 Settings = 240 Retorts.	Munich Chambers, 21⅓ Feet Long. 18 Beds = 54 Chambers.	Inclined Retorts 19·7 Feet Long. 18 Settings = 162 Retorts.	Inclined Retorts, 16·4 Feet Long. 24 Settings = 216 Retorts.	Horizontal Retorts, 19·7 Feet Long, with Charging and Discharging Machinery. 18 Settings = 162 Retorts.
Capital cost of installation, including retort-house, machinery, elevators, conveyors, breakers, &c.	£51,400	£62,300	£79,800	£38,100	£47,350	£36,100
Interest at 4 per cent., and depreciation at different rates for different items	£5,066	£6,204	£8,011	£3,695	£4573	£3,600
Make of gas, in cubic feet per ton of coal	11,840 (coal gas) 1,435 (water gas)	11,840 (coal gas) 1,435 (water gas)	12,200 (coal gas)	11,125 (coal gas)	11,125 (coal gas)	11,125 (coal gas)
Coke used in heating settings, per cent. of weight of coal carbonized	13·50	14·50	16·00	13·50	13·50	13·50
Tar produced, ditto	5·00	5·00	4·50	4·50	4·50	4·50
Ammonia produced, ditto	0·325	0·325	0·26	0·26	0·26	0·26
Net cost of coal (at 20s. per metric ton) after deducting receipts for coke (21s.), breeze (5s.), tar (25s. verticals, 20s. remainder), ammonia (£25 10s.), and the coke for water gas (25 lbs. per 1000 cubic feet) for a make of 700 million cubic feet per annum	£16,055	£16,874	£19,481	£21,768	£21,768	£21,[illegible]68
Labour required per diem if 12-hour shifts; men	16	22	15 (one shift only)	30	36	37
" " " if 8-hour " ; "	22	29		42	50	52
At 4s. 6d. per day, the wages paid per annum would amount to—						
If 12-hour shifts	£1051	£1450	£[illegible]85	£1971	£2365	£2432
If 8-hour "	£1445	£1905		£2759	£3285	£3416
Maintenance charges on settings machinery	£1350	£1350	£2100	£2800	£2850	£3100
Cost of current or power for machinery and steam for water gas (verticals)	£790	£942	£640	£584	£616	£840
Total retort-house cost of manufacture of 700 million cubic feet of gas, including interest and depreciation charges (men working 12-hour shifts)	£24,263	£26,766	£31,218	£30,818	£32,172	£31,741
Total retort-house cost of manufacture, per 1000 cubic feet of gas	8·25d.	9·10d.	10·60d.	10·46d.	10·94d.	10·77d.



Cross Section.

Plan.

Retort-House Area, 23,142 Square Feet.



Cross Section.

Plan.

Retort-House Area, 15,317 Square Feet.

COMPARISON OF DESSAU AND BOLZ VERTICAL RETORT INSTALLATIONS, EACH FOR A MAKE OF 4,400,000 CUBIC FEET OF GAS PER DIEM.

Table II.—*Carbonizing Results with Bolz and Dessau Vertical Retorts.*

Type of setting and place . .	Bolz Settings of 20 Verticals, 13 Feet Long, at Trieste.									Dessau of 10, 13 Feet, at Zürich.				Dessau of 12, 16·4 Feet, at Mariendorf.	
Trial conducted by	Trieste Gas-Works.						Professor Bunte.			Zürich Gas-Works.				Professor Bunte.	
Description of coal	English Pelaw-Main.				English New Pelton.		English Pelaw-Main.	Ostrau Mixed Screened and Rough Coal.		Ostrau Screened.		Ostrau Rough.		Mixed Silesian.	
Carbonizing time, hours . . .	12				12		12	11		$10\frac{3}{4}$	$11\frac{3}{4}$	$10\frac{3}{4}$	$11\frac{3}{4}$	$10\frac{1}{2}$	12
Time of steaming (if any), hours	Nil.		2		Nil.	2	Nil.	Nil.	$1\frac{2}{3}$	Nil.	1	Nil.	1	Nil.	$2\frac{1}{3}$
Yield of coke (dry) per cent.	..	65·3	..	65·3	67·2	63·3	69·4	70·3	69·1	70·3	68·0	68·6	..	64·04	63·78
Gas made per ton of coal, cubic feet	11,461	11,616	12,850	12,812	12,001	14,355	12,619	12,233	13,661	11,809	13,082	12,040	13,352	11,423	13,854
Gross calorific power of gas, B.Th.U. per cubic foot	555	579	544	550	552	526	528	549	492	566	541	534	513	584	537
Mean specific gravity of gas	0·376	0·381	0·369	0·491	0·390	0·385	..	0·412	0·438	..	..	..	..	..	..
Coke used in heating settings, per cent. by weight of coal carbonized . .	..	13·4*	..	13·0*	..	13·0*	..	16·1†		..	..	..	..	14·5‡	14·1‡

* Unscreened coke, containing 15·1 per cent. of ash. † Unscreened coke, containing 10·4 per cent. of ash. ‡ Fork-picked lump dry coke.

carbonized at the Buda-Pesth gas-works. These, and the results with English coal, are tabulated in detail alongside results for the carbonization of the Ostrau coal in the Dessau vertical retorts at the Zürich gas-works, and the results of carbonizing mixed Silesian coal in the Dessau retorts at the Mariendorf works at Berlin. For the sake of easy comparison on the basis of English standard conditions of measurement of the gas (60° Fahr., and 30 inches barometer, saturated), the more important data afforded by the author's tables have been worked out, and are given in Table II.

The characteristic features claimed for the Bolz setting are briefly: (1) The heating gases flow past the narrow sides of the retorts instead of the broad sides as in the Dessau system. More uniform fall of temperature from the bottom to the top of the retorts is thus secured, and it is unnecessary to have so high a temperature at the base. Greater durability is thereby achieved. (2) More economical construction than the Dessau system. (3) The highest temperatures found in trials—viz., in the lowest part of the retort chamber, 1240° to 1288° C. in different trials—are considerably lower than the 1300° to 1500° C. specified in the Dessau patent (and what fire-brick material can resist such temperatures for long?), and even than those used in other settings. As a fact, the temperature of 1300° does not appear to be greatly exceeded in Dessau settings in practice, and then only for the lowest third of the retort. (4) The producer gas passages are readily accessible from both sides of the setting. (5) The disposition of the producer below the stage, and the use of a single chimney, admit of the retort-setting being worked with a minimum of draught—viz., $\frac{1}{5}$ inch to $\frac{1}{4}$ inch of water against $\frac{1}{3}$ inch to $\frac{2}{5}$ inch for the Dessau settings. Less blown dust or ash therefore passes into the furnace chamber. A coke slide from each side of the setting shoots the hot coke into a central conveying trough. (7) The hot coke may be diverted direct into the producer or into a water-gas generator if desired. (8) No special labour or power is therefore required for charging the producers. According to Herr Prenger, three men are needed to attend to the supply of coke to the producers of the Cologne installation of Dessau verticals. (9) The cost of installation of the settings is considerably lower than that of Dessau settings of the same productive capacity. (10) The total cost is lower also, as the Dessau settings require about 47 per cent. greater area for their erection. (11) Comparative sections and plans of a Dessau and a Bolz installation of the same capacity are given in the annexed figure, and show clearly the economy of space achieved by the latter. The retort-house for Bolz settings must, however, be about 13 feet higher, on account of the producers being under the stage; but in other respects it is more economically constructed. (12) The saving in cost of installation is about 15 to 20 per cent., varying according to local conditions. (13) The smaller surface of the settings means less loss of heat by radiation. (14) The total cost of manufacturing gas, as shown by Table I., is about 10 per cent. less than with the Dessau system. (15) Though the coal has to be raised to a greater height, the cost thereof is saved in the handling of the coke. (16) A water-gas generator can, if desired, be placed beneath the stage, and supplied direct with hot coke from the retorts. (17) As a result of the Trieste trials, Bolz settings for a daily output of $1\frac{3}{4}$ and $8\frac{3}{4}$ million cubic feet of gas are being erected at the Trieste and Buda-Pesth gas-works respectively. (18) The settings may be at first built for only ten retorts, and afterwards enlarged without difficulty, when occasion arises, to contain twenty retorts apiece. This adapts them specially to the requirements of smaller gas-works.

HEAT OF COMBUSTION AND ILLUMINATING POWER OF GAS.

The current number of the "Illuminating Engineer" contains the following remarks by M. Sainte-Claire Deville on "The Relation Existing between the Heat of Combustion of a Gas and its Incandescent Illuminating Power."

In order to explain—or rather to render plausible—the approximate practical proportionality which exists between the calorific power of a gas and its incandescent illuminating power, it is not necessary to invoke any very elaborate scientific principles. It suffices to bear in mind the following two points: By the incandescent illuminating power of a gas we understand the maximum value of the luminous efficiency, expressed in terms of the light yielded for a given gas consumption. Now, it has been demonstrated experimentally that a burner adjusted so as to yield this efficiency is very far from furnishing the absolute maximum of intensity possible. If the consumption of gas and air is increased, the actual light yielded by a mantle may also become very much greater; but this increase proceeds at a lower rate than that in the gas consumed, so that the efficiency falls off in value.

The temperature of the mantle cannot in any case exceed that of the flame; and, consequently, in the case of maximum efficiency, it is considerably lower. This being admitted, I imagine that a complete analogy may be drawn between the behaviour of an incandescent burner and that of a platinum disc on which a stream of heated air is allowed to impinge. The temperature of such a disc of platinum will depend mainly on two factors—the temperature of the blast of air and its speed of projection.

It is evident that a jet of air, at a temperature of 2000°, which is sufficiently slow will heat the disc to a lower temperature than one at 500° travelling at a very rapid rate. It is clear, too, that the disc will not assume the temperature of the stream of air unless the latter attains a certain very high speed; an increase in speed from this point onwards would produce no effect. In no case, however, will the temperature of the disc exceed that of the stream of air. But, inasmuch as the disc is usually at a lower temperature than that of the stream of air, in practice the speed of this stream actually plays a considerable part in the phenomenon. Imagine, for example, a disc maintained at a temperature of 1400° by a stream of air at 2000° flowing at the rate of 500 litres per hour. One may imagine that if the speed of the air were doubled the disc would attain a considerably higher temperature, and in excess of that which would be secured if the temperature were increased to 2050° and the speed maintained at its former value. In the case of the incandescent mantle, the temperature referred to is that of the flame, and the jet of air is the flame itself; the speed may be measured in terms of the quantity of heat developed per hour below the mantle.

Now, the maximum efficiency of the burner always co-exists with a temperature considerably lower than that of the flame; and we are therefore led to suppose that the factor of speed—*i.e.*, quantity of heat developed per hour—is of paramount importance, especially on account of the fact that we are here dealing with a series of hydrocarbon gases of somewhat uncertain composition, the theoretical temperature of combustion of which is very variable. A consumption of 200 litres of water gas gives rise to the development of 500 calories below the mantle, at a temperature of about 2020°. A similar consumption of ordinary town gas in the same time would lead to the development of

1000 calories at a temperature of 1950°. Is it therefore surprising to find that the mantle becomes much hotter in the latter case? Clearly no.

To resume, it appears that when an incandescent burner is so regulated as to yield its maximum luminous efficiency, the temperature of the mantle, in general, depends mainly on the speed of the exceedingly hot flame; and a change of a few degrees more or less in the flame-temperature produces relatively little effect. For a given consumption of gas per hour, the speed—*i.e.*, the quantity of heat developed per hour—is proportional to the calorific power of the gas.

In a previous series of researches on this subject carried out in 1894, I adopted another definition of incandescent illuminating power, which I designated as the luminous efficiency (referred to 100 litres) of the gas under the following conditions: A No. 1 incandescent Auer burner was fed with a supply of gas at a constant pressure of 50 mm. The supply of primary air to the burner was received through suitable measuring apparatus, and it was arranged to regulate the access of air in such a way as to secure the maximum intensity compatible with the consumption and quality of gas used, and the dimensions of the mantle. The maximum efficiency (purely relative) corresponds to an intensity and a temperature of the mantle much less than those obtained according to the absolute definition laid down at the commencement of this article. Under these conditions, the theoretical temperature of the flame does not play any material part, and the efficiency depends solely on the speed—that is to say, the calorific value.

In subsequent researches undertaken by myself in 1901 and 1905, and presented at the International Photometrical Congress in 1907, I dealt with "intense" combustion—that is to say, with conditions under which the temperature of the mantle, while being still far distant from that of the flame, yet approaches much nearer to it than in the researches described above. The influence of the speed and the heat of combustion are, however, still sufficiently pronounced to enable us to conclude that the efficiency may be regarded in practice as proportional to this quantity.

But in such cases one can observe the effect of the flame temperature; and our conclusions, as formulated at the International Commission referred to, are as follows: "The incandescent illuminating power of a mixture of illuminating gas and water gas is proportional, not to the calorific power of the mixture, but to the calorific power subject to a proportional correction of 15 per cent. of that of the water gas entering into the composition of the mixture."*

As I have stated above, one can, for a given mantle, and disregarding the consumption of gas, secure certain relative proportions of gas and air which enable us to measure the upper limit of the luminous intensity of the source. The figures obtained for various gases and the same mantle may be considered, up to a certain point, as indicative of the characteristic properties of each gas studied. But the efficiency resulting in this case is not that which is important from the standpoint of the consumer.

I have demonstrated that in the case of illuminating gas it is, in general, the lightest gaseous constituents, having the lowest calorific values, which are mainly instrumental in determining this upper limit of the intensity of the burner, and which yield the highest figures. But this conclusion would not apply to the efficiency in its industrial sense.

It seems, *a priori*, that in this case the temperature of the mantle is sufficiently distant from that of the flame to render it possible for variations in this quantity to affect the result very materially. In a word, we approach the conditions characteristic of a platinum disc which is subjected to the action of a jet of hot air sufficiently rapid to maintain temperature equilibrium with it; and the influence of speed disappears.

I imagine that those who feel any difficulty in accepting the conclusions I have formulated forget the distinction which must be drawn between conditions corresponding with the absolute upper limit of intensity and the maximum efficiency respectively.

* The author's work in connection with the Commission was noticed in a series of articles in Vols. XCIX. and C. of the "JOURNAL."—ED. J.G.L.

Wedding of Mr. J. L. Cloudsley, jun.—The announcement is made of the marriage, on the 3rd inst., of Mr. John Leslie Cloudsley, the second son of Mr. J. L. Cloudsley (Messrs. Parkinson and W. & B. Cowan, Limited) to the younger daughter of Mr. and Mrs. William Morrison, of Reigate.

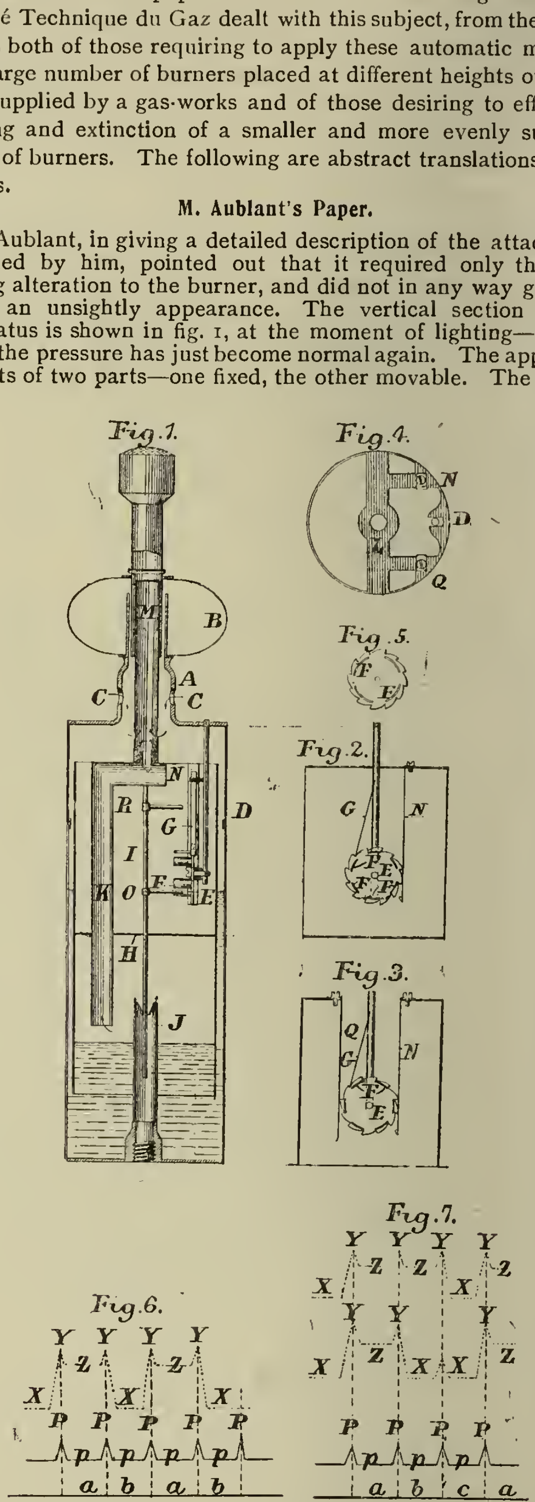
The Second "Water Arbitration" Prize.—This prize, the origin of which will doubtless be in the recollection of many of our readers, will be awarded next year by the Council of the Institution of Mechanical Engineers, under the following conditions: The award will be made for the best original paper, dealing with any branch of the mechanics of the supply or distribution of water, accepted by the Council for publication, with or without discussion, in the "Proceedings" of 1910, provided that the paper is of sufficient merit. Papers should be sent in not later than Sept. 1, 1910, and should be illustrated by scale drawings; but they may be accompanied by photographs, lantern slides, and specimens. Any paper not accepted will be returned to the author. The prize will have a value of about £30, and will be accompanied by a certificate bearing the seal of the Institution.

SYSTEMS OF LIGHTING AND EXTINGUISHING INCANDESCENT GAS-BURNERS FROM A DISTANCE.

A number of the papers read at the recent congress of the Société Technique du Gaz dealt with this subject, from the standpoints both of those requiring to apply these automatic methods to a large number of burners placed at different heights over the area supplied by a gas-works and of those desiring to effect the lighting and extinction of a smaller and more evenly supplied series of burners. The following are abstract translations of the papers.

M. Aublant's Paper.

M. Aublant, in giving a detailed description of the attachment designed by him, pointed out that it required only the most trifling alteration to the burner, and did not in any way give the latter an unsightly appearance. The vertical section of the apparatus is shown in fig. 1, at the moment of lighting—that is, when the pressure has just become normal again. The apparatus consists of two parts—one fixed, the other movable. The former



consists of a cylindrical vessel, open above, to the base of which the supply pipe of the gas is fixed, and rises about half-way up the vessel. The latter has fitted above it a second cylinder of equal diameter, the upper part of which is a kind of cap A, terminating in a tube, in which the lower tube of the burner can accurately move. An anti-vibration spring B permits of a certain amount of play vertically. The vessel contains a liquid—such as glycerine—which has no action on copper, does not dry up, and is not susceptible to extremes of temperature. Apertures C allow of access of air to the burner.

A vertical rod D, screwed into the piece C, supports a disc E, which takes the form of a ratchet-wheel (fig. 2), and carries on one side a series of projecting pins F, placed against alternate teeth of the ratchet; there being blank spaces opposite the alternate teeth. A catch-piece or pawl G, fixed to the rod D, prevents the disc from turning backwards.

The movable part of the apparatus consists of a bell formed by a hollow cylinder divided into two parts by a partition H. Through this partition pass: (1) A rod I, placed accurately in the axis of the bell and guiding the latter, its lower end entering the small funnel which forms the inlet of the gas J. The funnel allows of the ready insertion of the rod when the bell is put in place. (2) The outlet tube of the gas K, which is placed laterally

and bent in the upper part so as to bring it into the axis of the apparatus. It is attached by a male union joint, held firmly in place by the aperture L cut from the solid plate (fig. 4).

The outside thread of this union joint carries the injector tube of the burner M, provided with an adjustable air supply. The upper part of the tube fits into the lower tube of the burner, and can move easily therein. To the plate L there is also attached a catch-piece N, which is bent at right angles, as shown in fig. 2. The central rod I carries an arm O, placed so as to pass into the empty spaces on the disc E or to meet the pins J, according to the position of the ratchet-wheel. The catch-piece N gears with the teeth of the wheel, and serves to rotate this latter to the extent of one single tooth each time the bell rises (position Y in fig. 6).

The action of the apparatus is as follows: The bell is designed of dimensions to rise to the top of its travel by a pressure P, of (say) 70 mm. of water, and to fall to the lowest point of its travel by a pressure *p*, of (say) 60 mm. of water. The works see to it that during the day a pressure is kept in the mains equal to, or less than, *p*. At the time of action, the pressure for a few seconds is allowed to rise to P, and then to fall again to *p*. In fig. 1 the bell is shown at the moment of reverting to the normal pressure; the arm O resting on a peg F of the wheel E. The gas enters by the tube J and ascends to the burner by the tube K, where it is lighted by a bye-pass light, a platinum igniter, or any other suitable means. In fig. 6, the pressure of the gas is indicated in solid lines, and the corresponding position of the bell in dotted lines. At the instant when the pressure rises from *p* to P, the bell is lifted to the top of its travel (position Y) and the catch-plate N thereby turns the wheel one tooth—a space coming opposite the arm F. At the end of a few seconds, the normal pressure is restored and the bell drops; the tube K then dipping into the liquid and the gas being cut off from the burner.

At another instant, pressure is again raised from *p* to P. The bell again rises; the wheel turns another tooth, and offers another peg F below the arm O. At the same moment, the tube K is raised and the gas lights as before.

Some few seconds later, the normal pressure is restored, and the bell falls so that the arm rests on the peg. This movement is not sufficient to cause the tube K to dip into the liquid (the burner therefore continuing alight), but it leads the catch-plate N under another tooth of the wheel.

There are thus re-established the same conditions as previously; and the same movement has to be repeated only as many times as is necessary in order to light and extinguish the burners—the series of movements here described taking place on every burner supplied with an attachment.

When, as is most usually the case, burners are extinguished in two separate series at different times, a modified form of the apparatus has to be employed for each series. As seen in fig. 3, the apparatus consists of the parts already described, but carries also a second catch-plate Q, fixed to the plate L. This additional pawl is symmetrically placed to the first on the wheel, but acts the opposite way—causing the wheel to move forward one tooth every time the bell falls. The rod I also carries a second arm R. The action in this case is as follows: The bell being as before in the position for lighting, and the arm O resting on a peg, a rise of pressure lifts the bell and the catch-plate N brings up an empty space, in place of the peg. Thus neither of the two arms meets with any obstacle in its vertical travel, and the bell falls to the bottom, when the normal pressure is restored. But at the end of this movement, the pawl causes the wheel to move forward one tooth, and a peg comes opposite the arm R. When the pressure is again raised, the bell rises, but only as far as is permitted by the stop formed by the arm and peg. This rise not sufficing to lift the tube from the liquid, the burner continues extinguished. But the pawl Q has been led over another tooth of the wheel; so that when the normal pressure is restored, the bell falls again, and another empty space is brought above the arm. This period of extinction lasts until a further rise of pressure lifts the bell, lights the burner, turns on the wheel one tooth—bringing a peg under the arm O, which latter rests there until the normal pressure is restored. Conditions are then as at first, and this sequence of operations is repeated indefinitely.

If, in an apparatus similar to that shown in figs. 1 and 2, the wheel E of fig. 2 is replaced by that of fig. 5, in which each peg occupies the space of two teeth, the action is different from that in the two previous cases. Each time the pressure rises, the pawl moves the wheel forward the amount of one tooth; but when the pressure has been restored under the bell, the latter can fall to the bottom of its travel only once in three times. The two other times it is held in the position Z (fig. 7), admitting gas to the burner. It will therefore be clear that by using these two varieties of the apparatus on one and the same system, those of both kinds produce lighting of the burners simultaneously; but the first will cause extinction earlier than the second (as seen from fig. 5), even when both are subjected to the same series of alterations in pressure. It will, of course, be obvious that still other species of action are obtainable by ringing the changes on the relative positions of the pegs and spaces between them.

Although, as has been stated, a difference of 5 mm. pressure suffices to work the apparatus, that is not to say that the gas-works needs to put on only this difference of pressure. The very considerable differences in pressure in different parts of the system dispose of this assumption at once. Apart from actual variations in the pressure at the works, the difference in level of the mains causes varying pressure, and there is further the disturbing factor of consumption in different sections of the mains. These variations exert a considerable influence on the difference of pressure which requires to be created in order to actuate the apparatus. In the case of a works where the outlet pressure at the time of lighting is 70 mm., an apparatus placed at the end of the system at the same level as the works will have a pressure the same as that at the works only when there is very little consumption taking place. At times of great consumption, the pressure will be only 50 mm.—that is, 20 mm. less. It will thus be evident that in working with an apparatus loaded for a pressure (say) of 75 mm., it is necessary to allow for the loss due to consumption, and therefore to provide extra pressure to the amount of 25 mm., or 90 mm. in all. The author, however, points out that it is not usual to find such a great reduction in pressure at the time of lighting up, which, as a rule, is before the period of maximum consumption. Reduction in pressure due to consumption is practically the same from day to day at a given hour, while that at the time the burners are extinguished is altogether negligible. In most works, too, the use of the apparatus is favoured by the reduced pressure which is maintained during the day, and is raised in the evening at the time of lighting up burners employed in the public streets. This movement being of daily occurrence, it is possible to load the apparatus for a pressure a little less than the normal pressure of the evening, but greater than the normal day pressure; and in this way automatic lighting may be practised without making any departure from established custom. It is necessary, however, to point out that the extinctions which take place at the moment the pressure is reduced call for a special movement—that is, the pressure must be kept for a few seconds at the same value as at the moment of lighting.

The author gives a table of pressure for the twenty-four hours, in the case of a system employing automatic lighting apparatus, adjusted to 63 mm. Pressure up to 7 o'clock in the evening remained constant at 50 mm., from 7 to nearly 8 o'clock. It was 55 mm. from 8 to 10 p.m.; a shade over 70, dropping to 60, by 10.30; and remaining at this pressure until 11.30, when the first series of burners was put out, the second extinction taking place at 4 o'clock. The apparatus was found to work well—a result which is no doubt due to the strength and simplicity of its working parts, all of which are perfectly protected. There is no resistance to the force employed in actuating it; this force depending only on the size of the bell, since it is equal to the product of the base of the latter by the variation in the pressure.

M. Aubert on the "Alex" System.

M. Aubert, in a paper on the "Alex" patent system for controlling both the supply and ignition of gas at the burners, first briefly reviewed the methods already suggested for the latter.

In comparing types of mechanism affecting the supply and cut-off of the gas from a distance, he pointed out that electric devices for these purposes may be divided into those for both supply and cut-off, and those in which the two movements are separate. Those of the second type are invariably of simple and usually of strong construction. They may work by gravity, by expansion of levers from the heat of the burner, and by friction. A variety of methods may be employed for the cut-off; and a study of them led the author to the method embodied in the "Alex" system. In this, the interrupter dispenses with regulation owing to its mounting in a flexible plate which secures it from shock.

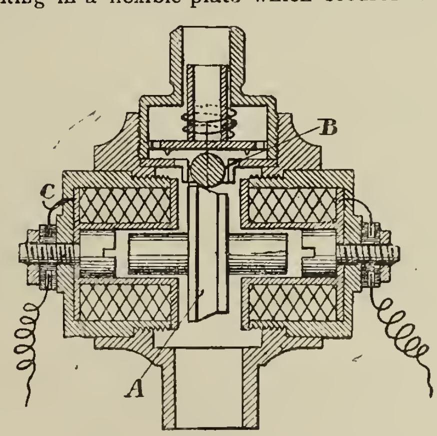


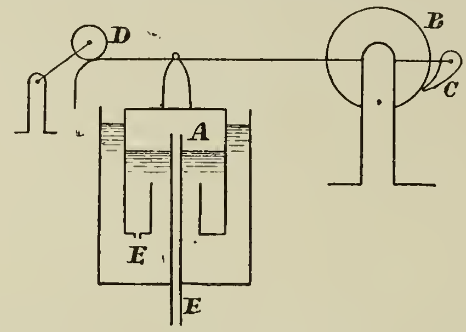
Fig. 8.

The transformers can be made up to go well as regards appearance with the usual types of fitting, for both ordinary and inverted burners. The igniter for the upright pattern of burner consists of a small fitting (for the glass chimney) in which is held a tiny lump of steatite pierced with two holes through which pass wires of German silver supporting both the high-tension flexible and that of the low-tension current—the two having a point of junction in the interior of the transformer. The transformers are machine-wound.

The "Alex" electric cock, like the transformer, is of very small size—only 30 mm. diameter and 32 mm. high. It is placed under an upright burner or over an inverted mantle, the same model being used in each case. As is seen in fig. 8 the arrangement

consists of two electro-magnetic coils, one for supply, the other for the cut-off of the gas; the winding being outside the gas and mechanically protected by the magnetic breech C. The coils actuate a cylindrical armature A with two passages. According to the position (right or left) of the armature, one or other of the passages comes in the centre of the apparatus, and a ball B rises and falls with the movement of the armature. This ball communicates its movement to a valve that controls the supply of the gas.

The system is said to be equally applicable to street-lamps, for controlling which the devices based on a momentary excess of pressure of the gas, as well as those involving clockwork, have met with only partial success. In the "Alex" system, the principle of excess of pressure is used, but only to actuate an electric relay, which latter can be made as sensitive as desired. The device takes the form of a bell and ratchet-wheel (fig. 9). The bell is



A. Bell. B. Contact Disc. C. Pawl. D. Counterweight. E. Outflow. F. Gas-Pipe.

Fig. 9.

set in movement by the excess of pressure from the gas supply F, and causes the ratchet-wheel to move, thereby making alternately contacts for supply and cut-off. This arrangement is contained in a box with the batteries either in the lower part of the lamp or in a case of thin cement or cast iron at the side.

The same pattern is made to work with a spring; a clockwork movement being used for the electric contacts. The clockwork is likewise placed in a box with the interrupter and the batteries; and protection is thus afforded against the theft of the mechanism. The system is also adaptable to the lighting of railway carriages, the apparatus being devised to light simultaneously up to fifteen burners in each coach.

M. Vexiau and the "Tip-Top" Flash Light Apparatus.

M. Vexiau described the use of the so-called "Tip Top" apparatus of the Société Française de Chaleur et Lumière, for the automatic lighting and intermittent illumination of advertisement and similar signs. Comparing the cost of electric light and gas, figures were cited to prove that for an intermittent illumination of a sign of nine letters each requiring two lamps of 5-candle power the cost per 1000 hours by electricity, giving a total light of 90-candle power, would be 150 frs., while with gas, giving a total light of 280-candle power, the cost would be only 35 frs. Assuming that the first cost of the lantern for the display of the sign is the same in each case, the outfit for the electric light is much more expensive—a motor being necessary at a price of 200 frs., to which must be added the expense of keeping it in order. The "Tip Top" apparatus, on the other hand, is both small and inexpensive, and can be easily fixed. It requires no motive power, being actuated by the repeated attraction of a steel ball by a permanent magnet. The ball forms the flap of a valve by which the gas is supplied; an intermittent flow of the gas being obtained by the action of the magnet which is hinged to a lever placed outside the chamber containing the ball, and, when swinging close to the latter, draws the ball more or less off the diaphragm of the valve. The apparatus is adapted for displaying a sign alternately in two colours; the burners in this case being arranged in the lantern in two series.

M. Badon-Pascal and the Rostin Lighter and Extinguisher.

M. Badon-Pascal, in the course of a paper on the Rostin apparatus (a description of which has already been given in our pages), pointed out that the pressure acting on the bell of the apparatus is that of the main, and therefore the force needed to open the cock remains constant; and as there is very little friction, the work to be done in displacing the floats is almost *nil*. The result is that the apparatus possesses great certainty of action, and a sensitiveness such that supply can be commenced when the pressure reaches the amount most convenient for the service. There is no occasion to employ an excess of pressure when commencing supply; and any excess subsequent to lighting-up has no effect. Excess of pressure is needed only when cutting off the supply of the gas. Both these features of the Rostin apparatus are of value, he said, in avoiding accidental extinctions or lighting-up at the time of increasing the pressure in the morning or by variations of pressure in the evening.

A table was given, showing the number of works in England, Holland, and Denmark where the instruments are in use, from which (after allowing also for those in other countries) it is estimated that at present about 20,000 burners are fitted with the Rostin apparatus.

M. Gaulis on the Kilchmann Automatic Lighting System.

M. Gaulis, after comparing the two systems of automatic control—viz., by excess of pressure and by clockwork—remarked in his paper on the irregularities caused in the latter by variations in the pressure due to varying level in the district of the mains and differences in consumption at different times. The pressure system was, he said, best employed within a comparatively limited area not far from the works; while clockwork devices might be appropriately employed in more remote parts of the system. The Kilchmann apparatus has been in use at Marseilles for two years past on street-lamps, to the number of 480, in conjunction with No. 3 Welsbach burners, and with the Visseaux and Kern burners. The position of the lamps on the quays and jetties at Marseilles has meant that the apparatus has been exposed to the north-west wind of the Mediterranean and to salt spray. In some cases the exterior has been a mass of sand and salt; but, nevertheless, the working parts, thanks to the double casing, have not suffered any derangement. More than 600 of the instruments have been supplied to the Marseilles Company this year; and similarly satisfactory results are said to have been experienced at Montpellier, Clermont-Ferrand, and Orleans. Where the mains are in a thoroughly satisfactory condition, the author recommends apparatus working by pressure; in other cases, those in which the control is by clockwork.

A Supplementary Communication by M. Lhomme.

At the close of the papers, M. Lhomme, of Rueil, supplemented his remarks at the congress last year by giving comparisons of the cost of lighting and extinguishing gas-burners in his town, where the Alder and Mackay (pressure) and Gunning (clockwork) systems are in use. He said it was estimated that the beat of a lamplighter should not include more than 200 lamps in districts where these are about 50 metres distant, or 150 lamps where they are more widely scattered. In these conditions, one inspector cannot replace more than three or four lighters; but at the same time they can attend to the cleaning of the lamps, and therefore the cost of labour is diminished by the amount of the wages of a man doing lighting and cleaning, which may be taken at about 30 frs. per month for 200 lamps. A daily inspection (not weekly, as at first anticipated) has turned out to be needed; and so any miss-fires that may occur are put right every day. On these accounts, the costs of upkeep slightly exceeded the estimates; but to set against this, it has been found that the number of glasses and mantles used has fallen from 23 to 17 per cent.; so that, making allowance for lighting materials, oil, alcohol, &c., the following comparison may be made between the two systems for a series of 200 lamps :—

Automatic Lighting.	Francs.	*Lighting by Hand.*	Francs.
Gas consumed by pilot-lights	1400	Lighters' wages	2400
Inspectors' wages . . .	360	Lighting expenses . . .	40
Total	1760		
Less saving in mantles, glasses, &c.	240		
Net cost. . . .	1520		2440

Total reduction in cost for 200 burners, 920 frs., or 4·60 frs. per burner per annum.

That is to say, a sum of 4·60 frs. per annum is to be set against the upkeep and depreciation of the apparatus, the value of which is 20·35 frs. for those working by pressure and 36·75 frs. for those actuated by clockwork.

The pressure appliances were used on 200 burners in the Courbevoie district, which is fed by a trunk main 600 mm. diameter, and supplies in all 837 lamps. Owing to the pressure varying a good deal in different places, consequent upon the conformation of the town, the instruments were set to suit the pressure at certain points. The makers' instructions to give an excess of pressure of about 25 to 30 mm. were followed at first; but it was found that the sudden change gave rise to trouble. The meters were blocked, burners flamed or hissed, and those adjusted to work best at high pressure (the number of which has been reduced by every possible means) showed for a short time such improved brightness that many requests were made for a constant supply of gas at the higher pressure. The bell of the apparatus remaining raised after the momentary extra pressure, advantage was taken of the arrangements at Courbevoie to light up without excess pressure. The maximum pressure of 70 mm. was caused to mature at the time of lighting up (the instruments being adjusted to this value) and, to make doubly sure, a slight extra pressure of 8 to 10 mm. was given. The bells remained up until 11 p.m., descending in the course of the night; an excess pressure being used to extinguish the lights in the morning. Irregularities in pressure due to consumption militated against this plan. If the excess was resorted to, there were the inconveniences above mentioned; while if it was not, a good many burners would miss fire. This difficulty was got over in the following manner: Electrical communication

by bell was established between Courbevoie and the factory at Rueil, and the latter was thus advised as soon as the 80 mm. pressure was reached. This was done by means of a gauge somewhat resembling a pressure indicator. The registering cylinder was removed, and the rod made to carry in place of the drawing-pen a small cup filled with mercury, in which the terminals of the two wires could dip when the excess of pressure brought the cup to the level at which they were fixed—the current then passing. In these circumstances, the assistant at Rueil moved his regulator on until warned by the bell that the pressure at Courbevoie was 80 mm. By working in this way, miss-fires were reduced to 2 to 3 per cent. The Alder-Mackay instruments have worked satisfactorily, except for occasional blockage with naphthalene, as was to be expected, in distributing tubes of small diameter. In hard frost also, it was found that some of the bells were held in the cup by ice, and would not rise: but a little oil applied to the edge of the bell readily prevented recurrence of this mishap.

With reference to the use of an electrical method of lighting the lamps, attempts have been made during the past year to replace the pilot-lights by an accumulator arranged so that the current passes to a greater extent as the pressure reaches its maximum. The accumulator is connected with the main by a small tube which maintains the liquid at a certain depth below the negative plate, which is arranged horizontally. At the moment when the excess pressure comes on, the liquid ascends in its box, reaches the negative plate, and lights the burner. This little device costs scarcely anything to keep up, and saves the somewhat considerable consumption of gas in the pilot-lights.

Of the Gunning clockwork instruments, 317 are in use, and the number of miss-fires is about 1 per cent.; the chief cause of the latter being the extinction of the flash-light due to the accidental displacement of the distributing cock, and less frequently to the stoppage of the clockwork mechanism. In later patterns, the makers have modified the instrument with a view to facilitating removal and adjustment; but the new model, unfortunately, is more readily stolen, and has also in one or two cases led to an escape of gas which has caught fire at the small flame and injured the clockwork. The cause of these drawbacks is the modified method of mounting.

The "Rapid" instrument, which has also been tried, resembles that of Gunning in its general arrangement, but avoids accidental displacement of the cock. Two installed since August, 1908, have not given rise to a single miss-fire.

Tar-Painting of Roads at Burton-on-Trent.—We learn from a local paper that two roads at Burton-on-Trent which were tar-painted last year have again received this attention, with the result that the dust nuisance has been considerably mitigated. Several other ventures have also been made in this direction, such as the tar macadamizing of portions of two streets, with great success. Another street is to be dealt with. The tar-mixing plant recently installed is stated to be producing 200 tons daily of tar macadam, at considerably less cost than that at which the material can be purchased.

Proposed Trial of Automatic Gas Lighting at Newcastle-on-Tyne.—At a meeting of the Lighting Committee of Newcastle-on-Tyne Corporation last Tuesday, the report of the deputation appointed to visit towns where an automatic system for lighting and extinguishing public gas-lamps is in operation, noticed in the "JOURNAL" for the 22nd ult. (p. 908), was further considered; and it was agreed to recommend that a trial of 250 of Alder and Mackay's controllers should be made as an experiment. The report and recommendation will be sent on to the Watch Committee for approval, and thence to the City Council for confirmation.

Water-Works for Hexham District.—At the last meeting of the Hexham Rural Council, it was stated that 16 tenders had been received for carrying out the works of water supply for Haydon Bridge. It was resolved to accept that of Messrs. Henderson and Wilson, of Ponteland, subject to their quantities being priced out and their sureties satisfactory; failing this, the tender of Mr. C. M. Skinner, of Newcastle, to be accepted on the same conditions. It was also resolved that the Council should accept the tender of Messrs. J. Marshall and Co., of Hawick, for carrying out the new scheme of water supply for the village of Wall, subject to the above conditions; otherwise that the tender of Mr. C. M. Skinner, of Newcastle, be accepted.

Reductions in Price.—The Alton Gas Company have announced a reduction in the price of gas, to take effect on the 1st of November, from 4s. 6d. to 4s. 2d. per 1000 cubic feet, with 5 per cent. discount for cash; thus bringing the net price to 3s. 11½d. The Secretary of the Sudbury Gas and Coke Company, Limited (Mr. C. G. Grimwood), has issued a circular announcing that the Directors have decided to reduce the price of gas, as from the 1st inst., 5d. per 1000 cubic feet if consumed for lighting, and 3d. per 1000 cubic feet if used for stoves and motive power; making the prices 4s. 2d. and 3s. 9d. respectively. The price of gas at St. Mary Church (supplied by the Torquay Corporation) has been reduced from 3s. 3d. to 3s. per 1000 cubic feet as from Michaelmas next.

Extension of High-Pressure Gas Lighting in the Strand.—At the meeting of the Westminster City Council on Thursday, an application was received from the Gaslight and Coke Company for consent to an extension of their high-pressure gas-main from the Strand, by the "Morning Post" offices, along the eastern footway of Wellington Street, to Waterloo Bridge, in accordance with a plan accompanying the application. The service is required for the purpose of supplying high-pressure gas lighting on the bridge for the London County Council, and it will connect with the City Council's high-pressure system in Aldwych, Kingsway, the Strand, and Wellington Street. The Company stated that the extension of the main will in no way impair the efficiency of the Council's lamps; and the application was granted.

REGISTER OF PATENTS.

Facing Retort Mouthpieces.

JOHN RUSCOE AND CO., LIMITED, and HOPKINSON, A., of Hyde.

No. 5756; March 10, 1909.

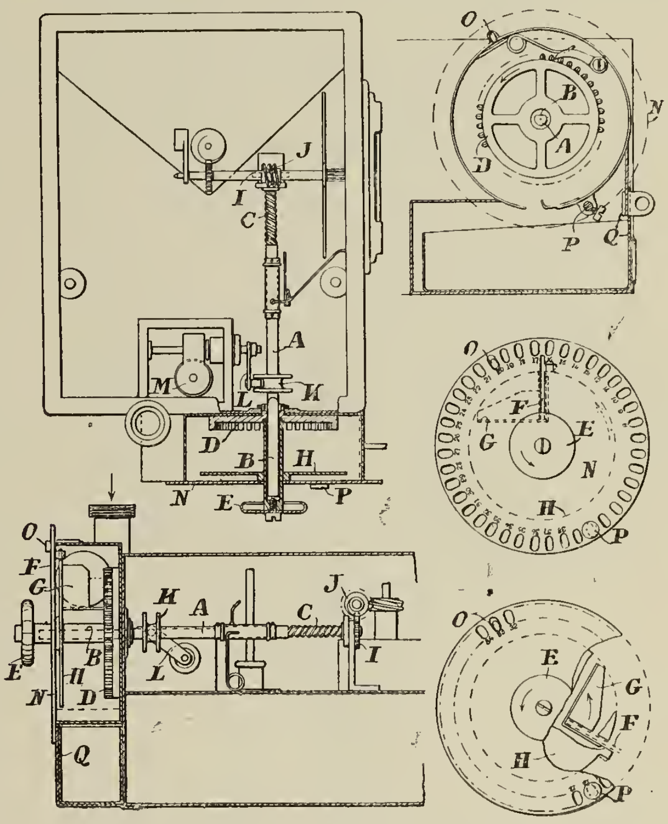
This invention relates to machines for facing the ends or mouths of gas-retorts of the type constructed with a securing frame or support to fit within the retort; a former to correspond with the contour of the retort-mouth; and a tool carrier guided by the former. The arrangement is such that the parts whereby the operating handle works on a fixed centre at or near the centre of the securing frame, instead of following the path of the former and the machine, can be employed equally for facing the mouths of straight or inclined retorts—a vertically swivelling joint enabling this to be done.

Coin-Freed Mechanism for Gas-Meters.

SMITH, G. B. & E. W., of Kennington Park Road, S.E.

No. 9961; May 7, 1908.

This invention relates to prepaid gas-meter mechanism in which price-changing arrangements are used in combination with measuring-out mechanism. The price changing is accomplished by the use of a rotatable coin-carrier capable of being set at variable predetermined distances, and in which the coin when inserted engages a crown toothed wheel and turns it the predetermined distance; while the measuring-out mechanism is attached to the crown toothed wheel and is operated in such a manner as to open a gas-supply valve when the crown-wheel is turned—the valve being reclosed by gear from the mechanism of the meter.



Smith's Coin-Freed Gas-Meter Mechanism.

The shaft A, which is flattened at B and carries a worm-thread C, is made in one piece, with the flattened portion passed through the crown toothed wheel D, which is normally free from the external handle E but can be attached to it by a coin of the right size inserted through the slot F. The coin enters a carrier G, which is rigidly attached to the handle, through the disc-like plate H. Upon inserting the coin into the position shown, its forward edge enters a recess between two of the teeth of the crown toothed wheel and locks the wheel to the handle, so that, if the handle is turned, it rotates the toothed wheel, and, according to the position at which the coin-slot has been set, the rotation of the wheel is controlled—the turn given to it being smaller or greater as may be predetermined.

The rotation of the wheel turns the shaft; and because of the worm on it, the shaft is drawn through a toothed wheel I (capable of rotation, but of no lateral movement), which meshes with a worm wheel J connected to the meter mechanism. The shaft is provided with a grooved disc K, into which a pin on the end of an arm L attached to the gas-valve is fitted, in such a manner that the movement of the shaft, after the insertion of the coin, opens the gas-valve M and admits gas through it.

The mechanism of the meter is connected to the worm J, which, meshing with the toothed wheel I, returns the shaft to its normal position, before a coin was inserted, and closes the valve M; the return action being fast or slow according to the rate in which the gas is consumed—the valve being definitely moved (non-automatic) in its action.

The front plate N, in which the coin-slot is made, is provided with a number of holes around its periphery, designed to engage a fixed stop O and a removable stop P, of pin-like form, which is only accessible through the coin-receiving box Q. A pawl is provided to prevent

reverse rotation of the crown toothed wheel, and the further the coin-slot is from the coin outlet, which is furnished with a stop to engage the coin, the greater the quantity of gas given for the coin.

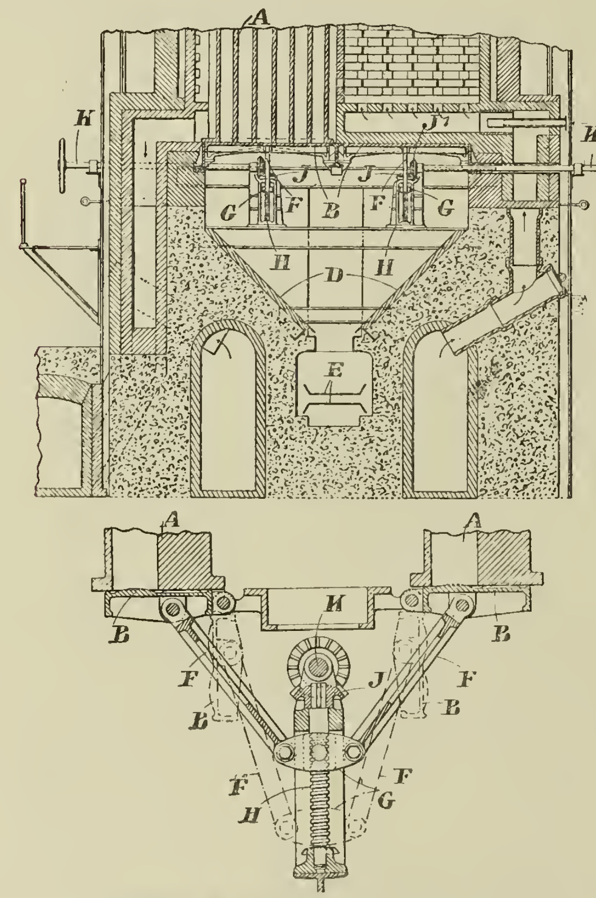
The first of the two discs shows that the front plate is adjusted to give 20 cubic feet of gas each time the handle is turned, and the lower one to give 33 feet. The shaft shown is furnished with a pointer, the end of which is designed to travel on an external gauge to indicate the quantity of gas remaining unconsumed at any desired time, and a spring is provided to press against the grooved disc K and prevent the possibility of the thread C jambing in the wheel I through overwinding, should this occur. When pressure is applied to the handle, the spring will, when the handle is released, pull on the thread and return it to a proper position in the wheel I—there being sufficient play between C and I for this purpose.

Discharging Vertical Retorts.

Parker, T., of Wednesfield.

No. 14,165; July 3, 1908.

This invention relates to the discharging of the residue obtained in the destructive distillation of coal in vertical retorts or retort-tubes ["Coalite" process] of the type in which the residue is caused to fall upon inclined walls at the base of the ovens or retorts and thence to the conveyor, to be carried away. It has for its object "to provide improved means of this type in which the walls are inwardly inclined, and arranged at such a distance below the common discharge door of the retorts that the residue is broken up, and then passes down the respective inclined walls to the conveyor."



Parker's Arrangement for the Discharge of Vertical Retort-Chambers.

The illustration represents a furnace-setting in which two series of vertical retorts or retort tubes are mounted.

In carrying the invention into effect, the patentee arranges the retort or retort-tubes A in bunches or batteries, with the tubes in close proximity to each other; and each bunch or battery is closed at the bottom by a common cover-plate B (hinged or pivoted in position), operated by links F pivoted at one end to the cover-plate and at the other to a nut G, which is raised or lowered by the screw H, upon the upper end of which is mounted a bevel-wheel J gearing with a corresponding wheel mounted on the shaft K, which may be operated by a hand-wheel from outside the apparatus.

Preferably there are provided two series or sets of bunches or batteries of retorts or retort-tubes in line; and at a distance beneath the lower extremity of the retorts or retort-tubes are two inwardly-inclined walls D, one at each side, so that as the charge falls out of the respective bunches or batteries of retorts or retort-tubes on either side it is broken up, and then passes down the respective inclined walls and into a position between them, where a conveyor E is mounted to carry the broken material to be quenched.

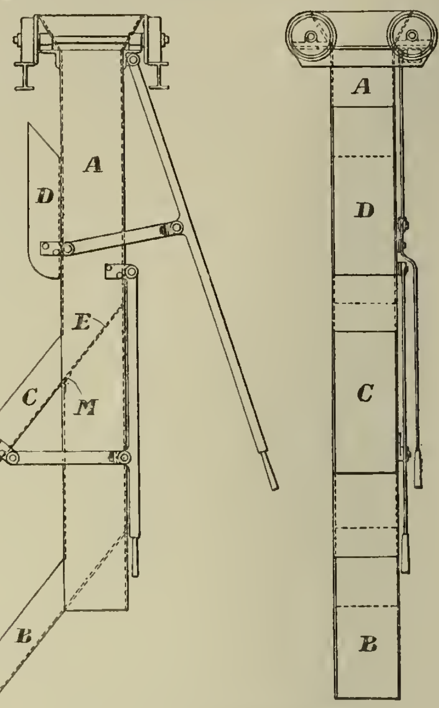
The upper edge of the inclined wall D may, it is said, be advantageously about 3 feet beneath the lower mouths of the retorts or retort-tubes, and the lower edge 5 feet beneath.

Coal Charging Shoot.

Love (the late), G. R., of Guildford.

No. 15,126; July 16, 1908.

This invention relates to the charging of retorts by shoots of the kind in which the coal may be discharged at different levels by means of movable partitions—more particularly intended for charging inclined gas-retorts in lines, in tiers of three or more.



Love's Retort-Charging Shoot.

As illustrated, a main vertical shoot A is entirely closed on three sides; suitable openings being left for the shoots B, C, D, in front. They all work on hinges M, and are provided with levers, which enable any of the shoots to be placed either across the mainshoot A, as shown at C, so as to catch coal passing down the shoot and charge it into the retorts on its corresponding tier, or in a vertical position as shown at D, in order to leave the shoot quite clear for the coal to pass down to a lower partition—the external portion of the movable shoot being then folded back against the front of the main shoot.

According to a modification in construction, the front of the main shoot may be left almost entirely open. In this case, the movable shoots C D are arranged so that, when in their vertical position, the plates E forming the bottoms of the shoots form the greater part of the front of the main shoot, and prevent coal falling out as it descends to lower shoots.

Charging Gas-Retorts.

Jervis, J. J., of Swindon.

No. 13,591; June 27, 1908. No. 27,305; Dec. 16, 1908.

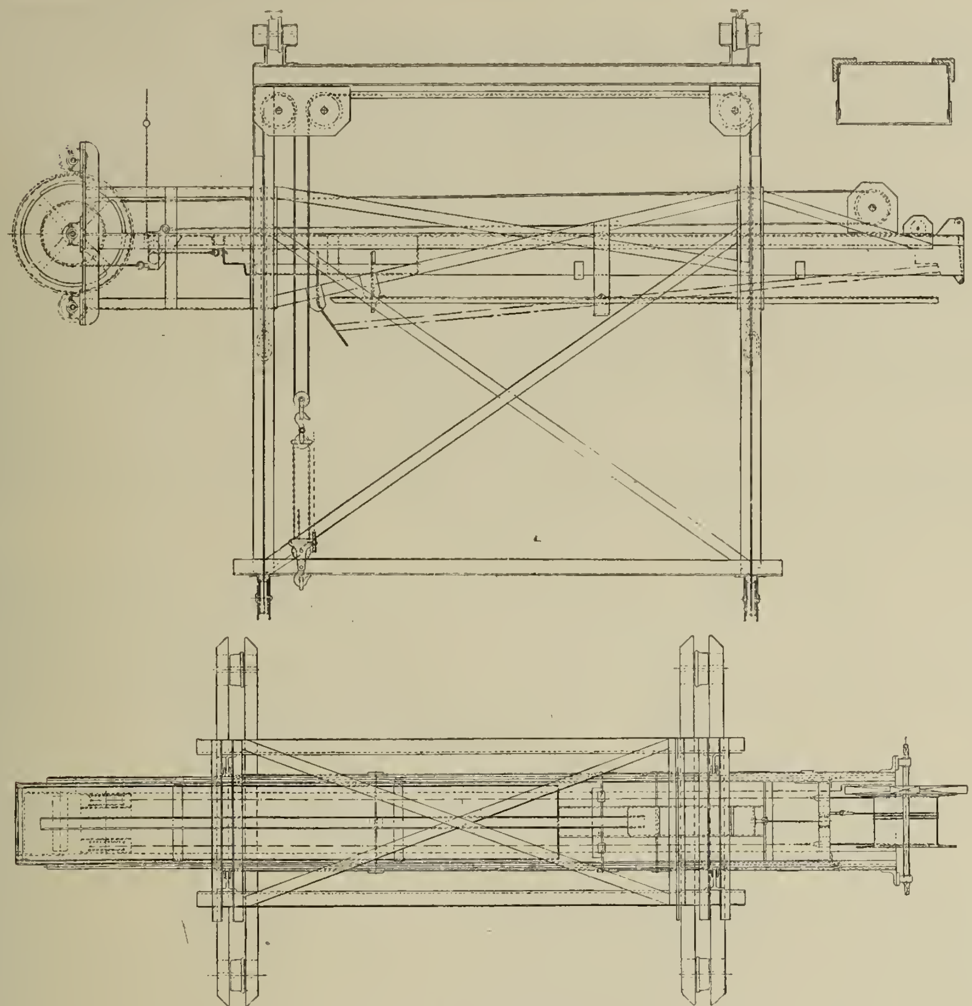
Under these two applications, one complete specification (under section 16 of the Patents Act, 1907) was accepted on June 10 last.

The invention has reference to improvements in retort-charging machines of the type in which the scoop used for conveying the coal into the retort is made in two sections, and carried on a cradle adapted to be moved up and down on a structure for the purpose of charging retorts at varying heights from the ground. The scoop is withdrawn in two sections; the bottom section being first withdrawn to permit of the coal falling by gravity on to the floor of the retort, after which the top section of the scoop is withdrawn in order to re-form the scoop ready for charging.

In machines of this type, the patentee points out, it has been proposed to employ a continuously revolving endless chain having lugs on it, which abut against catches on the scoop sections, for propelling the scoop into the retort and for withdrawing the bottom while the top section is retained by a catch; the catch being lifted by a lug on the chain, which, on the continuous movement of the latter, withdraws the top section into its final position to re-form the scoop. It has also been proposed to construct a retort-charging machine in which the scoop always remains intact. A scraper frame (carrying a number of scrapers) being arranged on the top of the scoop sides in such position that, while the scoop is withdrawn, the scraper frame is held stationary; the coal being pushed by the scrapers on to the floor of the retort. Mechanism, such as a lever of the first order—a stop-bar—is provided on the structure in a position adjacent to the side of the scoop and adapted to be held out of action by means of a projection on the portion of the structure carrying the scoop. The position of the stop-bar is such that, when the scoop is driven into the retort, it is released—thus enabling the rear or heavier end to drop, by gravity, and raise the front end to lock the scraper-frame until the fuel has been discharged. The lever is then released by a cam on the scoop coming in contact with the rear end of the stop-bar.

The object of the present invention is to construct a retort-charging machine of this kind in which a cradle carries the scoop and also a hand winch, with means, such as wire ropes, for driving the scoop intact into the retort, and withdrawing it in sections—*i.e.*, partly withdrawing the bottom section, to enable the fuel to be deposited on the floor of the retort, after which the top section is withdrawn concurrently with the bottom section; the top section being finally withdrawn by hand haulage or by a connection to a hand-operated winch.

The means for retaining the top section of the scoop in the retort while the bottom section is withdrawn comprise (as shown) a stop-bar, arranged over the scoop, on a pivot on the cradle structure, and held in its inoperative position by a hinged catch lever. The latter is operated by a tripping strip on the bottom of the scoop, to release the



Jervis's Retort-Charging Machine.

stop-bar, whereby its front end drops behind the extension of the scoop sides for the purpose of holding the latter while the bottom portion is withdrawn. To place the stop-bar in position, to be held inoperative by the catch lever, a release lever is adapted to be operated by a tripping strip on the bottom section of the scoop when the latter is being withdrawn.

The means used for holding the stop-bar in its inoperative position, and for releasing it, may be modified by dispensing with the catch and release levers and substituting therefor a bell-crank, having a connection from its upper arm to the rear end of the stop-bar; the other arm of the bell-crank bearing on a raised plane formed on the extension of the bottom of the scoop.

The illustration shows an elevation of the machine, in which is indicated, in broken lines, the position of the stop-bar, together with the stepped end on the extension of the top section of the scoop, when the scoop is driven right home into the retort; also a plan, omitting the position of the stepped end on the extension of the top section of the scoop, and also the means for raising the cradle.

Producing Gas from Tar, Oil, or the Like.

Rincker, F. G. C., and Wolter, L., of Amsterdam.

No. 16,027; July 28, 1908.

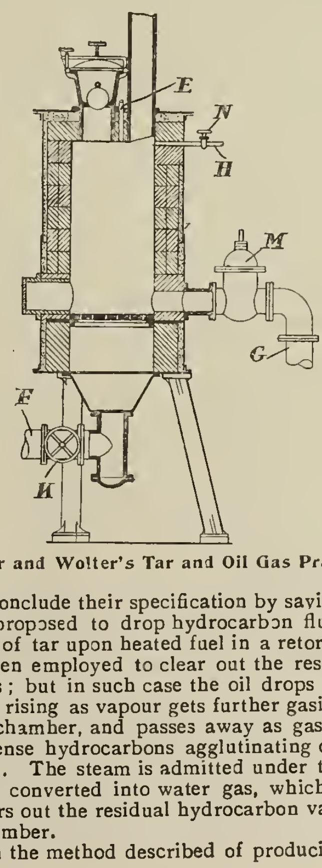
According to this method of producing gas, the oil or the like is conveyed downwards in the known manner on to glowing coal heated to a certain temperature in a generator, and is converted into gas, which is drawn off (under suction or otherwise) from the lower part of the generator. The essential feature of the invention is that after the oil or tar has been introduced into the generator, and after the temperature is reduced, so that the materials cannot be converted into gas, steam is blown into the generator from the upper part to pass the remaining vapour through the fuel into the outlet.

The generator shown is lined inside with fire-brick in the known manner, and is fitted above with a feed hopper for introducing the fuel. E is the pipe for introducing the oil or tar from which the gas is to be produced; and F is the pipe through which a current of air is conveyed for blowing-up the generator. G is the pipe through which the gas produced is drawn off; and H the steam-pipe. The different pipes, as well as the chimney, are furnished with shut-off valves; as also is the oil-pipe E.

The action of the apparatus is as follows: The valves K, M, N, and the valve in the oil-pipe E, are closed, and the valve on the chimney opened. A quantity of wood and coal is then put into the generator and lighted. The generator is filled to a certain height with coke or the like. The valve K is then opened, and a current of air is introduced into the generator through the pipe F, by means of a fan (not shown), for blowing-up or making a good fire in the generator. When the coal has reached a certain desired heat, the valves I and K, that in the chimney, and the pipe F respectively, are closed, the valve M opened, and oil or tar is fed to the generator through the pipe E. This material always comes in contact with fresh layers of glowing fuel, is vaporized, and passes out at a maximum temperature as gas through the pipe G.

When the fire is so far reduced in temperature as not to convert efficiently the tar and like vapours into gas, the pipe E is shut off and the valve N opened, and steam is admitted through the pipe H into the generator, which forces the vapours in the generator through the fire into the pipe G. So soon as this has been done, the valves M and N are closed and the valves K and I opened. A fresh current of air will thereupon resuscitate the fire, bringing it to the desired heat for a repeat of the operations.

This blowing in of steam is continued until all the oil or tar vapours remaining in the generator are passed into the outlet, "so that when the air supply to the generator is again effected, no troublesome oil, tar, or other vapours containing gas can escape into the open air."



Rincker and Wolter's Tar and Oil Gas Producer.

The patentees conclude their specification by saying: We are aware that it has been proposed to drop hydrocarbon fluid or mineral oils composed largely of tar upon heated fuel in a retort or chamber, and that steam has been employed to clear out the residual hydrocarbon vapours and gases; but in such case the oil drops on to the fuel, and is volatilized, and rising as vapour gets further gasified by the heat of the walls of the chamber, and passes away as gas at the top of the apparatus—the dense hydrocarbons agglutinating or caking upon the surface of the fuel. The steam is admitted under the fire and passes through it to get converted into water gas, which water gas passes upwards and clears out the residual hydrocarbon vapours and gases at the top of the chamber.

They claim: In the method described of producing gas from oil or

tar conveyed downwards on to glowing coal heated to a certain temperature in a generator, and the gas produced drawn out of the generator from below the fuel, "the distinguishing feature that after the temperature of the fuel has been reduced so that the materials cannot be converted into gas, steam is introduced into the upper part of the generator, and, passing downwards, forces any remaining vapours or gases through the fuel to the outlet."

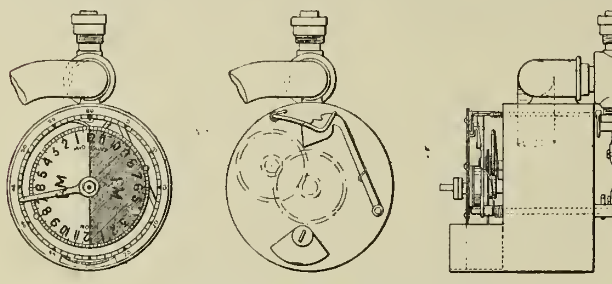
Controlling at Predetermined Times the Lighting and Extinguishing of Gas.

Harris, H. W., of St. Johns, Kent.

No. 18,172; Aug. 29, 1908.

This is a modification of the apparatus described in patents No. 9552 of 1903 and No. 14,879 of 1904, and is "designed to simplify and render cheaper and more compact in construction such apparatus whereby to especially adapt same for controlling at predetermined times the supply of gas to street-lamps, other gas-burners, and for analogous uses."

In this construction, the patentee proposes to use a similar time-mechanism as in his 1904 patent, with some additional parts. The motor mechanism described is, however, dispensed with; and use is made of mechanism of the type wherein a co-lighted operating lever in conjunction with a detent lever are actuated by the adjustable arms of the time-mechanism.



Harris's Lamp-Lighting Controller.

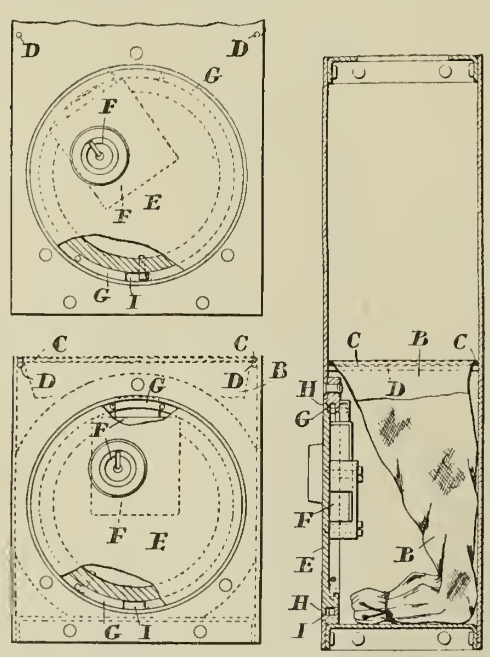
An idea of the arrangement proposed will be gathered from the accompanying illustration; and it may be mentioned that the specific claim made by the patentee is thus set out: In apparatus of the kind described, the combination with the time and the setting mechanisms of spring-controlled interlocking levers mounted intermediate of the mechanisms, and whereof the one is adapted to be lifted and disengaged from the other by the setting mechanism, and the other lever is pivotally connected, by a spindle and levers or links, to the means for controlling the supply of gas, the flow of fluids, or for analogous purposes.

Prepayment Gas-Meters.

Mackenzie, J., of Nottingham, Mercer, A., of Longsight, Manchester, and Meters Limited, of Manchester.

No. 21,746; Oct. 14, 1908.

This invention has for its object to provide a more convenient form of coin-receptacle than has heretofore been employed and more efficient means for preventing unauthorized access to prepayment gas-meters. The invention comprises the combination with a protective casing of a



Improved Coin Receptacle for Slot-Meters.

coin receptacle supported in the casing and composed of flexible material held open at the coin-receiving end, the other or outlet end being laced, tied, or otherwise adapted for ready opening and closing. The casing is fitted with a circular locking plate placed in position by a partial rotary movement, whereby lugs or like projections are caused to engage shoulders for holding the plate and casing firmly together—a locking bolt preventing unauthorized rotation of the plate to obtain its removal.

The illustration shows one application of the invention; the locking plate being in its locked position, and above a similar view but with the locking plate in another position; also, a sectional side elevation of the parts.

The protective casing is made from sheet metal, and is secured to the meter. One form of coin receptacle comprises a piece of flexible material B in the form of an open-ended bag, the upper end secured upon a frame-like member C, freely fitting within the casing, and supported on pins D. The lower end of B is laced, or otherwise adapted to be readily closed and opened, and it is of such length that, when the locking-plate E (afterwards referred to) is withdrawn from position upon the casing, the outlet end of it can extend through the aperture in the casing for facilitating the removal of the contents of the bag. When the casing is closed, the lower end of B rests upon the bottom of the casing, as shown.

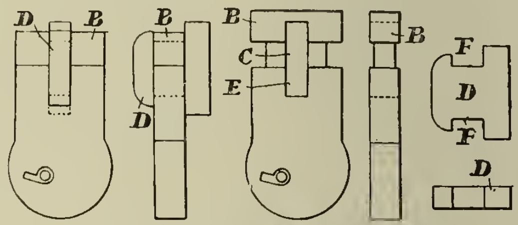
The locking-plate E is of circular form, and is fitted with a lock F controlled by a key. The casing, at the place where the locking-plate fits, is provided with a lip-like projection G, so arranged that when the corresponding portion H of the locking-plate engages with it the outer face of the plate lies flush with the surface of the casing. Grooves or slots I are provided, through which bolts or projections J upon the locking-plate pass. To place the latter in position, the bolt is passed through the slot I, and the plate is given a partial turn from the position, when the bolt passes behind the lip G upon the casing and prevents the withdrawal of the plate.

Padlock for Gas-Meter Cash-Boxes.

Reeves, R. B., of Whitstable.

No. 7923; April 2, 1909.

This invention relates, in particular, to that class of padlock which is furnished with a bolt that shoots radially in and out; and the arrangement provides "a novel construction of bolt, and a novel form of hasp or staple, both of which are characterized by great strength, solidity, and compactness."



Reeves' Gas-Meter Cash-Box Padlock.

The lock casing shown contains any suitable type of mechanism. Here B is the bolt having formed in it an elongated slot C through which the hasp D can pass. The top of the casing is slotted at E in line with the slot in the bolt; and the hasp has formed in each edge a notch F. When the bolt is shut out, the head of the hasp can pass freely through the slots C and E; and then when the bolt is shot back, it enters the notch F in one edge of the hasp, while the notch on the other edge engages with the lock casing. The hasp is thus held securely to the casing. It is not necessary for the hasp to have a notch in each edge, as a notch in one edge will ensure for some purposes a sufficient fastening. The head of the bolt is shown straight, and having the same external dimensions as the lock case. When in its innermost position, it lies close against the end of the case, which is also straight; but instead of being formed with a head, it may be uniform in width and thickness throughout.

APPLICATIONS FOR LETTERS PATENT.

15,035.—Vicary, T. V., "Incandescent burners." June 28.
15,052.—Krause, E. H. H., "Quenching coke." June 28.
15,071.—Lessing, R., "Decomposing hydrocarbons." June 28.
15,073.—Behr, H. C., "Inferential meters." June 28.
15,078.—Jones, A. O., "Coke-ovens." June 28.
15,079.—Hogermann, G., and Wellensick, F., "Clarifying and utilizing municipal as well as industrial water, more particularly waste water." June 28.
15,083.—Wilson, J., "Addition of reagents to water." June 28.
15,086.—Hansford, J., and Wright, J. F., "Automatically establishing and cutting off the supply of gas or other fluid." June 28.
15,087.—Saugey, M., "Pressure-reducing valve." June 28.
15,098.—Glover, J. A. F., "Gas cooking-ovens." June 28.
15,157.—Flint, A. R., "Internal combustion engines." June 29.
15,191.—Williams, T. E., Berger, E., and Burroughs, J. G., "Gas-lighting apparatus." June 29.
15,197.—Torchebeuf, C., and Lanneau, E. de, "Incandescent burner." June 29.
15,206.—Weidl, F., "Horizontal coke-oven." June 29.
15,236.—Blakey, J. W. & A. G., "Incandescent burners." June 30.
15,276.—Riecke, P., "Securing doors of retorts." June 30.
15,283.—Lamplough, F., and Bliss, W. H. W., "Blower and exhauster." June 30.
15,304.—Humphrey, A. A., "Raising of liquids by compressed gases." June 30.
15,350.—Sykes, T., "Mantles." July 1.
15,395.—Drummond, C. S., "Burner." July 1.
15,495.—Chipperfield Lamp Syndicate, Ltd., and Browning, E. M., "High-pressure gas-lamps." July 2.
15,506.—James, T., "Generating gas." July 3.
15,507.—Oulton, J., and Newhouse, W. A., "Anti-vibration gas-burner." July 3.
15,565-6.—Holzwarth, H., and Junghans, E., "Gas-turbines." July 3.
15,567.—Hancock, T., "Flexible joints." July 3.
15,569.—Cone, W. H., "Manufacturing gas." July 3.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Institution Gas-Heating Committee's Report.

SIR,—The illuminating power of town gas is as much a physical characteristic as its calorific power; and the chemistry of its combustion, whichever experiment is performed with it, is identical.

We do not, however, reduce to zero the volume of gas we pass through the photometer meter, in order to arrive at the illuminating power of the sample under test; and it does seem to me a misapplication of scientific principles to apply such a correction when the object of experiment is to obtain calorific, instead of illuminating, value.

We already correct the volume of gas indicated by our station-meter indexes to 30 inches barometer and 60° thermometer. Let us use the same denomination when we speak of the commercial use to which gas is put, whether it be used for lighting, for heating, or for power.

I think it would be a good thing, and calculated to save confusion in the future, if the Committee's report were corrected to the 30 inches and 60° basis before it is printed in the "Transactions."

South Metropolitan Gas Company, July 10, 1909. CHARLES CARPENTER.

SIR,—At last we have drawn an authoritative statement as to the high calorific value of the Leeds gas used in the Gas-Heating Research Committee's experiments; and, thanks to Mr. Edwards' letter in your issue of the 6th inst., we know that it is only a manipulation of the figures and the use of a standard of comparison that is not used by the gas industry, which is to correct gas to 60° Fahr. and 30 inches barometer, wet, and not to 0° C. and 760 mm. barometer, dry—see the instructions of the London Gas Referees, which are followed in the vast majority of the gas works throughout the United Kingdom.

I expected that the figures were obtained by this correction (though I had missed the explanatory note in the report), but wished to get the explanation from the Research Committee. Mr. Edwards, however, is the next best person. At the same time, it would have been better had he been a little less offensive in his style, and not assumed that all are ignoramuses but himself. We now know that, to reduce Leeds figures to those in general practice, we must deduct about 8 per cent. to make a comparison possible.

I should like to point out, however, that tables of calorific values of gases vary considerably. One table gives figures that work out to 127 calories at 60° Fahr. or 132·6 at 0° C.; while the figures (Thomsen's) on page 368 of "Abady's Gas Analyst's Manual" give a value of 150·4 calories at 60° Fahr. and 30 inches, and 162·08 at 0° C. and 760 mm., which are much higher than those claimed by the Leeds Chemist.

The percentage of benzene in the hydrocarbons (52 per cent.) seems abnormally high. Published analyses give quantities varying from 12 to 25 per cent. only; and at these proportions the calorific value of this gas at 60° Fahr. and 30 inches dry would be as follows:

Benzene . . .	12½ per cent.	141·67 calories
Ethylene . . .	87½ ,,	
Benzene . . .	25 ,,	144·51 calories
Ethylene . . .	75 ,,	

Proving that the heating effect by calculation can be varied at will by increasing or decreasing the proportion of benzene in the hydrocarbons.

One other point I wish to emphasize. All gas-works sell their gas more or less moist, and near normal temperature and pressure—viz., 60° Fahr. and 30 inches; so that any correction to conditions not usually obtaining are literally a fraud on the public if used for anything else than purely laboratory purposes. The late Sir George Livesey and Mr. Charles Carpenter have only lately succeeded in producing something like order in photometric methods; and already there is work for someone in authority to introduce uniformity in calorimetric practice. Should the Leeds methods of overstating the value become more general, perhaps the officials of the Gaslight and Coke Company would like to make a note of this new method in calculating the heating value of their gas. It would certainly put them out of all danger from penalties for deficient heating values.

Having obtained the explanation *re* the calories, I do not propose to pursue this correspondence further. I, however, trust that I shall have—not only in letters to the public press, but also in my private thoughts—a much larger charity than is evinced by Mr. Edwards. It is just possible that the scientific training of the critics of the report is not so advanced as is that of Mr. Edwards; but it is quite certain, from his impetuosity, that the training was received when the latter was probably in swaddling clothes, and it would be advisable for him to be a little more moderate in his tone on the next occasion he finds himself taking up the cudgels on someone else's behalf.

Stretford, July 9, 1909. H. KENDRICK.

P.S.—The tension of aqueous vapour at 0° C. is 4·525 mm., which proves the impossibility of obtaining a "dry" gas even at the arbitrary standard set up by the Leeds Chemist, and evidently explains the difference between the constant of 0·9237 used by Mr. Edwards and that given in Table 21 of Lunge's "Technical Chemist's Handbook," where the constant for correction from 15·6° C. to 0° C., and from 752 to 760 mm. is given as 0·936. Is this another case of differences in tables?—H. K.

Retort-House Work—Light v. Heavy Charges.

SIR,—Twelve months ago I should have taught the younger generation spoken of by Mr. Harman, that light charges quickly burnt off were the correct thing for gas making, at all events as far as horizontal retorts were concerned.

At one of our works, owing to difficulties with fuel, the Engineer was last year using a part of his plant on eight-hour charges; and, applying the principles referred to by Mr. Harman, I urged him to revert to six-hour work as soon as he got over his difficulties. I am free to acknowledge I was wrong, and that after making experiments in the way Mr. Harman suggests, with the same retorts, the same coal, and over a sufficiently long period to ascertain comparative values, I am quite satisfied with the more revolutionary method of operating.

Since the early part of the present year, we have been working on almost identical lines with those laid down by Mr. Ferguson Bell in his excellent and practical paper; and our results are an emphatic confirmation of his. We make more gas, more ammonia, better tar, and less breeze; the only point of difference is in cyanogen, which is about two-thirds of the former amount.

The altered position has been summed up, in one of his felicitous expressions, by Mr. A. F. Browne, who (at one of the conversations we have had upon the new system) described it as the "rehabilitation of the horizontal retort."

Mr. Bell deserves the thanks of the gas profession for the lucid paper, in which he drew attention to this; and I heartily commend it to the careful consideration of those engineers who are likely to be satisfied with ideal ends, even if they may not be attained by ideal means.

South Metropolitan Gas Company, July 10, 1909. CHARLES CARPENTER.

SIR,—With reference to Mr. Harman's letter in your last issue, I should like to say I am in general agreement with his observations.

It would be interesting to learn from the advocates of heavy charges of long duration, what benefits are obtained as compared with heavy charges of the usual duration of six hours.

I find it hard to conceive that there is any advantage to be gained by carbonizing at the rate of 24 cwt. per retort per diem in ten or twelve hours charges, over carbonizing (say) at the rate of 32 cwt. per retort per diem in six-hour periods. The experience I have had (of course, on a small scale) confirms my belief that the advantage lies with the comparatively heavy six-hour charges—especially as regards fuel used; and there is the further advantage of a higher production per unit.

It has been my experience that a high make of gas per mouthpiece was synonymous with a high yield of gas per ton, and a low fuel account as compared with moderate makes per mouthpiece with the same plant. This would appear directly contrary to what was advocated at the recent meeting of the Institution of Gas Engineers.

Waterford, July 10, 1909. J. G. TOOMS.

Recovering Ammonia from Dry Distillation Gases.

SIR,—In your issue of April 27, you have a description of a patent for recovering ammonia from gas produced in dry distillation.

Regarding this patent, we beg to state that it is an infringement of our patent rights for producing sulphate direct from the gas. Moreover, we wish to call attention to the fact that, as described in your paper, it would be an impossibility to produce the desired results.

The abstract of the patent specification states that the ammoniacal liquor that has collected in the reservoir is lifted by an injector pump through the condenser into the still. Later it is mixed with lime in the usual manner; and the ammonia is driven out of the water by the hot gases flowing through the still.

Now, it is a known fact that, if the steam and gas are mixed, the dew-point of the steam is immediately lowered; and as it is absolutely necessary in the distillation of ammoniacal liquor to have the water which is to be distilled brought to boiling point before the fixed ammonia can be driven out, you will readily see that this system cannot be a success.

H. KOPPERS,
Joliet, Ill., U.S.A., June 29, 1909. per Louis Wilputte.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time: Cardiff Corporation Bill, Gas Provisional Order Bill, Glamorgan Water Board Bill.

Bills reported, with amendments: Aldershot Gas and Water Bill, Ammanford Gas Bill, West Gloucestershire Water Bill.

Bills read the third time and passed: Harrogate Gas Bill, St. Andrews Water Order Confirmation Bill.

The Gaslight and Coke Company Bill, Glamorgan Water Board Bill, Llanelly Water Bill, Oldham Corporation Bill, and Watford Urban District Council Bill have been referred to a Select Committee, consisting of Lord Clifford of Chudleigh (Chairman), the Earl of Stradbroke, Lord Digby, Lord Wynford, and Lord Glantawe, who will commence sitting to-day.

The opposition to the Pontypridd Water Bill has been withdrawn.

A petition against the Cardiff Corporation Bill has been presented by the Llandaff and Dinas Powis Rural District Council; and a large number of local authorities have petitioned against the Glamorgan Water Board Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills reported, with amendments: Alliance and Dublin Consumers' Gas Bill, Gas Orders Confirmation Bill (No. 1), Lisburn Urban District Council Bill, Stourbridge and District Water Board Bill.

Lords Bills read the third time and passed: Gas Orders Confirmation Bill (No. 2), St. Andrews Water Order Confirmation Bill, Wakefield Corporation Bill.

ALLIANCE AND DUBLIN CONSUMERS' GAS BILL.

House of Commons Committee.—Tuesday, July 6.

(*Before Sir* Luke White, *Chairman, Sir* Clement Hill, *Mr.* Horniman, *and Mr.* Nolan.)

The object of this Bill is to enable the Alliance and Dublin Consumers' Gas Company to obtain additional money powers, to convert their capital into one uniform stock, and for other purposes.

The Hon. J. D. Fitzgerald, K.C., Mr. Honoratus Lloyd, K.C., Mr. James O'Connor, K.C., and Mr. A. M. Paddon appeared for the promoters. The petitioners in opposition were represented as follows: County Dublin County Council, the Killiney, Ballybrack, and Dalkey Urban District Councils, and the North Dublin, South Dublin, and Rathdown (No. 1) Rural District Councils, by Mr. G. M. Freeman, K.C., Mr. Vesey Knox, K.C., and Mr. Timothy Sullivan; Dublin Corporation, by Mr. Balfour Browne, K.C., Mr. Macinerney, K.C., and Mr. C. C. Hutchinson; the County Wicklow County Council and the Rathdrum Rural District Council, by Mr. Vesey Knox, K.C.; the Dublin Port and Docks Board (against alterations), by Mr. Pembroke Stephens, K.C.; and the Pembroke Urban District Council (Counsel reserved).

Mr. Fitzgerald, in opening, said the Bill was promoted by the Alliance and Dublin Consumers' Gas Company with the object of obtaining extensions of an ordinary character of their powers. The Company sought authority to raise further capital; to consolidate and convert their existing share capital; to construct an overhead gantry or conveyor to enable coal to be quickly conveyed into the works; to purchase the reversion of certain leasehold lands on which part of their works are situated; and to reduce to 14 candles the illuminating power of the gas as tested by the modern method in the No. 2 "Metropolitan" burner. Having described the district of supply and given a parliamentary history of the Company, Counsel mentioned that, as the result of an agreement with the City of Dublin, when the Company sought fresh parliamentary powers on a former occasion, the sliding-scale arrangement was adopted by the Company, and all claim to back-dividends to the amount of £187,000 was abandoned. The Company had never paid their full dividends; so that they could not be accused of being greedy in this respect. Their total authorized share capital, £926,000, had all been raised; while the borrowing powers, which related to £310,000, had been exercised except as to £64,000. Further capital was required to carry on the ordinary business of the Company; and share capital was therefore asked for to the amount of £345,000, with the usual borrowing powers as to one-third as much more. When the Bill left the House of Lords, the capital power was fixed at £360,000; but as the Company proposed to strike out of their suggested area of supply the districts of Delgany and Kilcoole, the capital had been correspondingly reduced. The Company had been subjected to the keen and severe competition of the electric undertaking of the Dublin Corporation. This concern was carried on at a loss; but the result of the competition was that the Gas Company had been deprived of many of their large consumers. In consequence of this, the Company some years ago determined to push their business among the poorer classes by means of slot meters. They had now some 33 000 of these consumers. The Company calculated that they would save about 2½d. per 1000 cubic feet in consequence of the reduction in the illuminating power and of the adoption of the new method of testing; the effect of the two changes being that they would be able to supply gas of 5½ to 6 candles less power than at present. When before the House of Lords, Professor Vivian B. Lewes stated that he thought 3d. would be a fair reduction to make in the standard price; and this reduction was accepted by the Committee and incorporated in the Bill. Reverting to the fact that the promoters had struck out of their proposed area Delgany and Kilcoole, he explained that in the House of Lords there was no opposition from these areas. The County Council of Wicklow, however, when the Bill reached the House of Commons, objected altogether to a supply of gas being given by the Company in their county; and the Rural District Council concerned said that, while they would like a supply of gas, they would only agree to its being given on the condition that the price should be the same as that charged in the City of Dublin. The suggestion of the Rural Council was ridiculous. The Company had therefore withdrawn this portion of the Bill.

Mr. *Francis T. Cotton*, the Secretary and Manager of the Company, giving evidence in support of the Bill, stated that they had three separate works. Their area of supply was one of the largest in the world; being nearly as great as that of the Gaslight and Coke Company. He mentioned a number of respects, such as the cost of manufacture, and capital, in which the Company were unfavourably situated in comparison with other concerns.

Cross-examined by Mr. Freeman: Of recent years there had been only a very slight increase in the ordinary consumers; but the number of prepayment consumers had risen from 10,765 in 1901 to 35,278 in 1908. Despite this fact, the increase in the gas sold was in most cases very small; and in 1905, 1906, and 1908 the sale actually decreased. The explanation was that the consumption of ordinary consumers had rapidly decreased, owing to the competition of the electric light and to the introduction of the incandescent burner. The consumption per consumer per annum worked out to 27,696 cubic feet; the corresponding figure in Edinburgh being 18,522 feet, and in Glasgow 22,000 feet. The real test, however, was the consumption per mile of main. The consumption of prepayment customers averaged about 7000 cubic feet per annum.

Cross-examined by Mr. Hutchinson: Between 1904 and 1908, the output diminished by 60 million cubic feet, yet the expenditure of the Company in this period amounted to £90,000; the outlay being in respect of slot-meters. This, however, did not justify the allegation that the works had been extravagantly managed. Witness undertook that if the Bill passed he would give each consumer an incandescent burner, mantle, and chimney.

Re-examined: He did not agree that the capital raised of recent years was disproportionate to the trade done. All the benefit of recent capital expenditure had not yet been reaped. The Corporation of Dublin charged different rates for water in different areas.

Professor *Vivian B. Lewes*, examined by Mr. James O'Connor, said the flat-flame burner now used for testing gas in Dublin was absolutely unsuitable for the purpose. The illuminating power of gas as used in any burner depended on the number of particles of incandescent carbon present in the flame. If too much air got into it, a great number of the particles were burnt or destroyed before they became luminous, with the result that as much light was not obtained as with exactly the right proportion of air. If a burner was to be a test-burner, the full light which the gas was capable of giving must be developed from it. Inasmuch as it would be impossible for any flat-flame burner to develop the full light which could be obtained, such a burner was not a proper one to use for testing purposes. The standard burner which had been recently adopted was a modified argand—the "Metropolitan" argand No. 2. It was one in which the air supply could be carefully regulated to fit the quality of the gas being burnt. This was the burner which the Bill proposed. He presumed there were testing arrangements at the three works of the Company; and he strongly advocated that the burner should be used at each. The saving which would be effected by the proposed reduction of candle power would be as nearly as possible ½d. per candle. This was what Parliament had generally allowed. The reduction of candle power in this case would mean a difference really of five or six candles; and in calorific power, the theoretical reduction would be approximately from 145 to 125 calories net, nearly 15 per cent., though in practice he would be sorry to say there would be any difference at all.

Cross-examined by Mr. Freeman: He did not agree that the saving per 1000 cubic feet of gas sold resulting from the proposed reduction of candle power was about 0·73d. With the present means of enrichment, a candle could certainly be added to the luminosity of the gas for one-third of a penny; so that the figure taken (½d.) was an outside one.

Wednesday, July 7.

On the resumption of the proceedings this morning,

Professor *Lewes*, in further cross-examination by Mr. Hutchinson, agreed that the lowering of the quality of the gas from 16 to 14 candles would result in considerable saving, which he put at 2½d. to 3d. If the Company adopted regenerative furnaces, and if they increased the produce per ton of coal from 10,000 to 12,000 cubic feet, the saving in coal alone would be from 3d. to 4d. per 1000 cubic feet. Counsel then suggested that gas now supplied in Dublin which was intended to indicate 16-candle power, and which, in fact, owing to the flat-flame burner being used, was 18-candle power, would, if tested with the proposed new form of burner, indicate 22-candle power; so that the Bill was really proposing a reduction of illuminating power of 7 or 8 candles. Witness, however, refused altogether to accept the suggestion. Questioned as to whether, for the purposes both of lighting and heating, the consumer would not have to use a greater quantity of lower standard gas, he said that for every other thing, except the flat-flame burner, the 3d. offered by the Company would amply cover any loss the consumer would suffer. Witness added that Counsel seemed to assume that as Dublin gas, when tested in the flat-flame burner, gave 16-candle power, the consumer, when using the gas in his flat-flame burners, obtained 16-candle power from it. This was a fallacy, because the testing, by which the gas was shown to be of 16-candle power, was carried out under conditions which were never adopted by the consumer when using the gas.

Mr. Hutchinson: Equally with the new burner, you will not find any consumer who will burn his gas under conditions which will give him the same results as those given by the proposed test-burner.

Witness: But he will find very much less difference between the proposed test-burner and the burner he is using than between the present test-burner and the burner he is now using.

In further examination, witness said the No. 2 and not the No. 1 argand burner should be used, because the No. 1 did not give a true result with 14-candle power gas.

The Chairman pointed out that, although the proposed test was contained in the Bill, there was a proviso that the Corporation could apply to the Board of Trade, and that the Board might direct that some more suitable test might be applied.

Mr. Hutchinson said it was provided that the Gas Referees should from time to time prescribe the burner for testing the illuminating power, and the burner so prescribed was to be of such a pattern as should be practicable for use by the consumer. Would the witness tell the Committee if either the No. 1 or No. 2 argand burner was one that would be practicable for use by the consumers of Dublin?

Witness replied that he told the Committee that this was a question for the Gas Referees, and that they had prescribed the No. 2 "Metropolitan" argand. It seemed to him the whole difficulty in London was overcome by the clause to which reference had been made, which really meant that the method was left in the hands of the Gas Referees. There was no reason why the calorific test prescribed in the London Gas Act of 1905 should not be prescribed in the same form here.

Re-examined: The loss which 14-candle power gas suffered when travelling was certainly not as large as in the case of 16-candle gas. The former, three miles from the works, would probably still be of 14-candle power; but the latter, at the same distance from the works, would be only of about 15½ candles. If there were a number of different testing-stations, the results shown at them would be different. No test for calorific power had been prescribed outside London.

Mr. *H. E. Jones*, examined by Mr. Fitzgerald, said he knew of no district where there was such a great length of pipes with such a small consumption of gas as that of the Alliance and Dublin Company. The capital could not be written-down, because it represented mains actually in existence, though the business done by means of them was, in some cases, insignificant.

The Chairman: The Committee are agreed that, subject to what may be stated hereafter, Dublin occupies an exceptional position with regard to mains and capital expenditure.

Witness, continuing his evidence, said there was no other place, save perhaps Liverpool, where such a high quality of gas was supplied as the Dublin Company were forced to supply owing to the requirement

ith regard to the flat-flame burner. It was as much in the interest of he consumer as in the interest of the Company that a lower grade gas hould be supplied. The Company were supplying an expensive article or which the consumer had to pay, but from which he obtained no enefit. He estimated the total capital requirement of the Company t £451,000, after deducting £20,000 for the districts struck out of the Bill since it was in the House of Lords. The No. 2 "Metropolitan" rgand burner had been recommended and adopted by the London Gas Referees. It had also been adopted by the Institution of Gas Engineers, y the Board of Trade, and by the authorities of Parliament who had rescribed it in the Model Bill. The reduction of illuminating power n the case of London brought about no increase in gas consumption —indeed, in some cases there was a small reduction.

Cross-examined by Mr. FREEMAN: The capital of the Dublin Company was £880 odd per million cubic feet sold in 1908. Bromley, with 787, and Newcastle, with £745, were the two next highest. There were, however, exceptional circumstances connected with the Dublin Company. One reason why they had fewer consumers than formerly was that the competition of electricity was so keen. Electricity was old in Dublin at less than cost; and the Company had to help pay the ates to make good the loss. The Company had lost customers, not ecause they obtained a better light from electricity, but because they ot current below the cost of manufacture.

Cross-examined by Mr. HUTCHINSON: The works of the Company were not badly arranged. The Company were now erecting regenerative furnaces and applying machinery to charging the retorts.

Counsel was proceeding to question witness with regard to the differential charges made by the Company in various areas, when

The CHAIRMAN, interposing, said if the Committee were setting up a rice for the first time, without the shadow of a doubt they would make o discrimination whatever. They had, however, to accept what had appened in the past, and to consider whether the time had now rrived when, seeing that the Company were applying to Parliament or fresh powers, they should put on a price for the whole district or ontinue the existing system.

Mr. *Corbet Woodall*, examined by Mr. HONORATUS LLOYD, supported he proposal of the Bill with regard to capital, and stated that the flat-ame burner, as a standard, was ridiculously antiquated. The proposed reduction of 3d. in the standard price, in consideration of the aving which would result from the lowering of the candle power, was beral. His own opinion was that it was a mistake to make deductions rom the standard price, even for such a consideration as was involved n this case. It was a pity to interfere with the working of the sliding-cale, if it was given its fair operation, so that a small proportion of ny gain went to the shareholders, while a much larger proportion went to the consumers. The inducement to the Company to use energy was greater when the sliding-scale was not interfered with; and the mall amount which the Company would receive if the sliding-scale were not interfered with in the present instance would therefore be money well spent.

In cross-examination by Mr. FREEMAN, who suggested that until the Company charged their maximum price for gas the proposed reduction f 3d. would not benefit the consumers, witness said that he did not hink the Company would act differently in the future from the way in which they had acted in the past. They would probably reduce the rice of gas as soon as they were able to effect the saving which would esult from the reduction in the candle power, and without waiting to ay the full dividend to which they were entitled. The Company, owever, were not bound to act in this way. He strongly advised them o give a pledge that they would make a reduction of 3d. from the ctual price. He was distinctly in favour of differential rates for outide districts where the cost of supply was much greater than in the oncentrated urban area. It would be unfair to the consumers in the more profitable area—the more thickly populated part—that the same rice should be charged outside. Although the Company had the right o discriminate between the parts of Dublin which had been added ince the passing of their Bill, he thought they would be well-advised f they made one price.

Mr. FREEMAN: You have said: "When suburban districts are growng in population and have become practically urban, they ought to ave a revision of the differential rate against them." Do you agree with that?

Witness: Yes.

Replying to further questions, witness said that whether or not the differential rate ought to go altogether depended on the particular circumstances of each case.

Mr. *W. R. Herring*, the Engineer and General Manager of the Edinburgh and Leith gas undertaking, also gave evidence in support of he Bill—on similar lines to that offered when the Bill was before the Upper House.

Sir *Thomas Robinson*, examined by Mr. PADDON, said he was ex-Chairman of the Kingstown Urban District Council, and a Director of he firm of Hayes, Conyngham, and Robinson. They used gas in the tores and warehouses and electric light in the retail parts of their establishments. The gas supply of the Company had always been very atisfactory.

Cross-examined by Mr. FREEMAN: The Kingstown Council petitioned against the Bill when it was in the House of Lords, and obtained all they wanted—namely, a new testing-station. The Kingstown District Council had a standing arrangement with the Company that any eduction in the price to Dublin should be followed by a corresponding eduction to Kingstown.

The CHAIRMAN said the Committee did not require further general evidence.

Mr. HONORATUS LLOYD: Then that will be the case for the Bill.

Mr. HUTCHINSON said that, as things stood at present, it would not be necessary for the Committee to consider the opposition of the Corporation of Dublin against the preamble. Terms had been come to between the Company and the Corporation which appeared to be quite satisfactory.

Mr. FREEMAN said that whatever had satisfied the Dublin Corporation would quite possibly go a long way towards satisfying him. It was clearly therefore to the advantage of all concerned that they should know fully what had been arranged.

Mr. HUTCHINSON gave the main heads of the suggested arrangement.

Mr. FREEMAN, in reply to the Chairman, said he could conceive two or three of the items affecting him very materially. An adjournment would give him an opportunity of considering his position, and seeing whether the spirit of reasonableness which seemed abroad could not be extended outside the boundary of the borough.

Thursday, July 8.

When the Committee met this morning,

Mr. FITZGERALD announced that negotiations had been going on with the Dublin Corporation which had resulted in an agreement being come to. The heads of the agreement had been signed by the parties, and would be submitted to the Committee.

Mr. BALFOUR BROWNE said that, with regard to certain matters, the Bill was to be modified: (1) There would be uniform prices in the whole of Dublin; (2) there was to be a reduction of the standard price to 3s. 7d.; (3) the photometer was to be the improved Letheby 60-inch Bunsen as approved by the Standards Department of the Board of Trade; (4) the words "dynamos and motors" were to be struck out of the fittings clause; (5) the additional stock was to be reduced to £300,000, with borrowing powers of £100,000; (6) the limitation of the special purposes fund to one-half the amount mentioned in the Bill, and a similar limitation of yearly contributions thereto; (7) a saving clause with regard to the supply of electricity by the Company, prohibiting the sale; (8) the last part of the proviso to clause 2 beginning with the words "and as if" to be struck out; (9) a clause to be inserted keeping the Corporation in as good a position as regards their rights in respect to the price of gas supplied to the public lamps of the City as they are at present; and (10) the pentane used in the testing operations to be up to the standard specified by the London Gas Referees at all times. These points would be submitted to the Committee, but beyond them an agreement had been arrived at.

Mr. FITZGERALD said it would save the time of the Committee if the definite alterations required in the Bill, and the definite terms of the agreement between the parties were settled and communicated to the Committee for their sanction.

The CHAIRMAN said the Committee must consider the terms so far as they would affect the other districts outside Dublin.

Mr. BALFOUR BROWNE: We have done nothing to prejudice the action of the Committee in any way. My learned friend and I are bound by the agreement that has been come to.

Mr. FITZGERALD said there was really no difference in substance between the Corporation and the Company; but it would save time if the details were settled and the whole matter put before the Committee in a definite form.

Mr. FREEMAN contended that there were secret clauses, and that he had been put in an awkward position.

Mr. FITZGERALD: There is nothing secret about it at all.

Mr. FREEMAN: There is an agreement made as to the price which is going to be charged for gas quite apart from the standard price in Dublin.

Mr. FITZGERALD: The Company have agreed that they will reduce the price in Dublin next year to 3s. 4d.; and they will keep it at this figure for the next three years, subject to this—that if the price of coal is raised they will be able to increase the price charged, and if the price of coal falls, there will be a corresponding decrease. There is no secret about it at all.

The CHAIRMAN: That will materially affect the price of gas to the consumers. It is a very serious matter, which the Committee will have to consider when they come to the preamble of the Bill.

Mr. FITZGERALD: It is a most important matter; and it was always the intention of both parties that it should be communicated to the Committee.

The Committee then adjourned for a short time, in order that the various details might be properly arranged. When the proceedings were resumed,

Mr. FITZGERALD read the heads of agreement, as a result of which the opposition of the Corporation would disappear. He said that the Bill had been amended so as to carry out the terms, which were substantially those that Mr. Balfour Browne had already stated. The Company guaranteed that the selling price of gas within the City of Dublin for a period of three years from Jan. 1, 1910, should not exceed 3s. 4d. per 1000 cubic feet unless the price of coal used by the Company in the making of gas (which coal is to be taken as now 13s. 6d. per ton c.i.f.) should be increased by 1s. per ton, in which case the Company might increase the selling price by 1d. per 1000 cubic feet, and a further 1d. for every additional increase of 1s. per ton; and the Company were to make a reduction of 1d. per 1000 feet for every decrease of 1s. per ton in the price of coal below 13s. 6d. per ton c.i.f. A junction was to be made of the mains supplying the north side of the city with those supplying the south side. This agreement had been signed by the Town Clerk of Dublin and the Chairman of the Company, and would not be inserted in the Bill.

The CHAIRMAN said he had not consulted his colleagues; but he did not think they ought to sanction the agreement which for three years would result in a different price being charged from that which was in the Bill itself.

Mr. FITZGERALD: It does not alter the terms of the Bill at all. It is merely a temporary arrangement between the Corporation and the Company as to the selling price to be charged during the next three years. It is not inconsistent, nor does it modify in any way the standard price in the Bill.

Mr. BALFOUR BROWNE said he was willing to have it either way.

Mr. FITZGERALD pointed out that at the end of three years there might be another agreement; and there might be some difficulty in having this agreement in the Bill.

Mr. FREEMAN asked whether the promoters had agreed with all the urban districts that they would be put upon the same basis as the City of Dublin with regard to the price of gas.

Mr. FITZGERALD: The promoters have agreed with the townships of Rathmines, Pembroke, Blackrock, and Kingstown that they should pay the same standard price as the City of Dublin. It is obvious from the many interruptions that the parties have not agreed.

Mr. FREEMAN: I have had so much difficulty in this matter that I am rather suspicious of the statements of the Company.

Mr. Balfour Browne: We have come to terms which we think fair, and we no longer oppose the Bill.

Mr. Fitzgerald said that the Company would agree that in the four townships mentioned the same price should be charged as in the City of Dublin; so that they were now, in substance, in agreement.

A further adjournment was then made, and when the proceedings were resumed,

Mr. Freeman said that, so far as the parties could agree among themselves, they had agreed to arrangements which would be submitted for the Committee's approval:

The price charged by the Company for gas supplied within the urban districts of Dalkey and Killiney and Ballybrack, and in the townland of Terrenure, all in the County of Dublin, shall not be more than 3d. and within the remainder of the limits of supply (within the urban district of Bray, in the County of Dublin) shall not be more than 6d. in excess of the price for the time being charged in the City of Dublin as now constituted, and the Company shall, when the circumstances are similar, allow a like discount within the aforesaid limits of supply as within the said city, provided that the excess price charged under this sub-section shall not affect the dividends of the Company.

The Chairman asked whether there were any other districts not represented before the Committee who were similarly placed as those who appeared there.

Mr. Fitzgerald replied that every district within the area of the Company's supply was represented with the exception of the town of Bray, who were not petitioning against the Bill because the circumstances in their case were exceptional. There was no profit from the supply there. It was a small town supplied by separate works, and under circumstances which obliged the price to be a high one; so that it was not proposed to make a reduction.

Mr. Vesey Knox said it was understood that the terms which applied to the rural part of the county of Dublin were also to apply to the rural part of the county of Wicklow.

Mr. Fitzgerald said there was not a single gas consumer in the county of Wicklow nor a single main laid there. There was really no demand for gas.

Mr. Vesey Knox contended that the rural part of the county of Wicklow should be treated in the same way as the rural part of the county of Dublin. Although he did not appear on behalf of Bray, he would say that the Company had power to lay mains, but they had never done so.

Mr. Fitzgerald said that, by clause 17, Bray was included in the other districts to be supplied by the Company at 4s. 9d.

Mr. Vesey Knox said that 4s. 9d. was a prohibitive price. If they were to lay mains there, they should be compelled to supply at the same price as in the neighbouring districts.

The Chairman eventually announced that the Committee would not alter the position of Bray and the district adjoining from that stated in clause 17 of the Bill.

Mr. J. J. Healy, who said he appeared on behalf of the Government Departments, tendered the following clause to the Committee, and asked them to include it in the Bill:

The Company may, if they think fit, allow discounts or rebates to consumers of gas in consideration of prompt payment of gas charges, not exceeding in any case 10 per cent., and, in addition thereto, or irrespective thereof, they may, if they think fit, allow discounts or rebates to large consumers not exceeding in any case 15 per cent., provided that all discounts or rebates shall be of equal amount under like circumstances to all consumers: Provided that the rates of discount or rebates to be allowed to a Government Department under this section shall be determined or calculated upon the guarantee accounts of that department.

The Chairman said Mr. Healy had no right to appear; but the Committee thought they would hear the application.

Mr. Fitzgerald said the invariable practice, where a Government Department required an alteration in a Bill, was for them to send their Solicitor or Parliamentary Agent. This gentleman really was not there as a representative of a Government Department, but was brought over for the Corporation of Dublin. No such clause as the one suggested was tendered on behalf of the Government Department in the other House. While the Bill was between the two Houses, the War Office (who were the parties mainly interested) put themselves into communication with the Parliamentary Agents for the Bill. They tendered three clauses for insertion, one of which was a clause relating to discounts. The promoters were unable to accept this clause; but they accepted the other two. The War Office did not press for the third.

The Chairman said that the application made was that, under the supply now given by the Company, the Department had no statutory right to require the Company to give them a discount, but that by an arrangement, taking into consideration the supply to the Department, the Company allowed a discount.

Mr. Healy: At present we are receiving 5 per cent., and other consumers are receiving 10 per cent.

Mr. Fitzgerald said there might be some twenty or thirty places throughout the area where a supply had been given to a Government Department; and they were now asking that the supply to all these places should be put together, and that they should get a discount on the aggregate. If they secured preferential terms, it was at the expense of the ordinary consumer.

The Committee were unanimous that they ought not to accept the clause.

The various clauses of the Bill were then adjusted; and the Bill passed through Committee.

Gas Profit at Cleckheaton.—The report of the working of the Cleckheaton Urban District Council's gas undertaking for the year ended March 31 last states that on a production of 116,312,000 cubic feet a net profit was secured of £2650. The price of gas is 2s. 6d. per 1000 cubic feet, with 10 per cent. discount for lighting and 15 per cent. for trade purposes. The cost of manufacture, including capital charges, was 21·26d. per 1000 cubic feet, and the net profit is equal to 8·44d. per 1000 feet.

HEYWOOD CORPORATION BILL.

Local Legislation Committee, Section B.—Thursday, June 24.

(*Before Mr.* Charles Nicholson, *Chairman, Mr.* Bateman Hope, *Mr.* Jowett, *and Mr.* Pearce.)

This was a Bill to make better and further provision with regard to the tramway, gas, and electricity undertakings of the Corporation of Heywood, and the improvement, health, and local government of the borough, and for other purposes.

Counsel for the promoters were Mr. Honoratus Lloyd, K.C., Mr. Hutchinson, and Mr. Keen.

Certain parts of the Bill were considered on previous occasions by the Committee. Part 4 related to gas, and was not opposed. On clause 25—"Charge for Gas supplied by Means of Prepayment Meters"—the Home Office made the following observations:—

"The proviso to sub-clause (2) of this clause does not appear in the corresponding provision in the Model Clause on the subject (Model Bills and Clauses as amended, 1908). Its object is, the Secretary of State presumes, to enable the Corporation to save themselves from loss in cases where the amount paid into the meter during the quarter is insufficient to cover a proper charge for the hire of the meter; but, as drawn, it appears to be meaningless. On the other hand, if in order to give effect to its supposed intention some such words as 'payment due from the consumer' are substituted for the words 'maximum charge as aforesaid,' as in the Mountain Ash Bill of the present session, then the proposal would be open to the following criticism:

"(*a*) It would allow the same charge to be imposed on the consumer who has used no gas at all and the consumer who has used and paid for some gas, but whose payment falls short of an amount equal to 10 per cent. on the cost of the meter. Both might be called upon under the proviso to pay the full 10 per cent. on the cost of the meter, the consumer who has already paid something into the meter no less than the consumer who has paid nothing, despite the fact that the price paid by the first-named consumer has presumably been calculated so as to include a charge for the hire of the meter. (*b*) It would infringe on the principle always observed in clauses dealing with prepayment meters hired with fittings, that the person using the meter is not to be liable to subsequent charges after the money in the meter has been collected. Persons who hire meters with fittings will usually belong to the poorest class of consumers, and it is important in their case that the whole liability should be included in the payments which they make from time to time into the meter, and that they should not be liable to be called on to make further payments at the end of the quarter.

"The Secretary of State suggests that the object aimed at would be better met by some such provision as was inserted in the Swinton and Mexborough Gas Bill of last session, in lieu of a proviso in similar terms to the one now under consideration—namely, 'The Company shall be entitled, if they think fit, to require a deposit of one shilling per quarter for the prepayment meter, provided that the amount collected from the prepayment meter during such quarter shall be applied in the first place in refunding the said deposit to the person who has paid the sum.' This proviso is not open to the objections raised above to the present proposal, and would seem fully to meet the necessities of the case. The Secretary of State is aware that the proviso in the Mountain Ash Bill referred to above was allowed by the Local Legislation Committee in respect of meters hired without fittings; but he gathers from the minutes of evidence that the method of meeting the difficulty embodied in the provision cited above from the Swinton and Mexborough Act was not brought under the consideration of the Committee. He has therefore set out the matter rather fully."

Mr. Keen said he would deal with the Home Office report, and explain exactly how the form in which the clause now stood arose. The clause, with the exception of one proviso, was the clause of the Model Bill dealing with the charges to be made for supplying through prepayment meters; and if the Committee would look at the proviso that was in the Bill as printed, and which had since been struck out, at the end of sub-clause (2) they would see, as deposited, the Bill contained this proviso:

Provided that in any case where the maximum charge as aforesaid shall not exceed an amount equal to a rate of ten per centum on the cost of the meter, the Corporation shall be entitled, if they think fit, to make a minimum charge not exceeding that amount.

The object of inserting a provision of this kind was this: A supply was laid on sometimes by means of a prepayment meter, and hardly any gas was taken throughout the whole quarter of the year through the prepayment meter; and the only power the Council had to make a charge in respect of the hire of the meter under the earlier sub-clauses of the clause was a charge based upon the quantity of gas that passed through the meter. It was all done by means of the penny-in-the-slot. Therefore, if no gas was taken, the Council not only obtained no payment for gas, but they got no payment in respect of the hire of the meter. The Council themselves provided the meters, and had to pay the capital charges and sinking fund, and so on, on the capital they invested for the purpose; so that they were in the position of having expended capital and not getting benefit in return for the expenditure. This question was raised in the Mountain Ash Bill, which came before the other section of the Committee; and the same proviso was inserted in the Bill, and it was passed by the Committee. He had the Mountain Ash clause; and the proviso read as follows:—

Provided that in any case where the amount to be paid by the consumer shall not exceed an amount equal to a rate of ten per centum on the cost of the meter, the Council shall be entitled, if they think fit, to make a minimum charge not exceeding the last-mentioned amount.

A notice of this was to be put upon the prepayment meter card. The Committee accepted the principle that there ought to be a minimum

charge to prevent loss on the part of the Council. He understood that in the other House the Lord Chairman raised some objection to the clause, in that it involved the Council coming after the end of the quarter and levying a charge upon the consumer, who had thought that his prepayment provided for all the payments he would have to make.

The CHAIRMAN: That is to say, his penny-in-the-slot covered the cost of the rent of the meter.

Mr. KEEN said that was so. But what the Lord Chairman suggested might be done instead was to insert the provision that was put into the Swinton and Mexborough Gas Act of last session. This was not an Act before the Local Legislation Committee, but an ordinary Gas Act; and the provision was put in there that the Corporation should, before giving a supply, require a deposit of 1s. for the quarter, and then that this deposit should be repaid at the end of the quarter, so far as a supply of gas had not been taken to use it up, and then that a further deposit should be made. In the Prestatyn Bill, which was the last Bill before the other section of the Committee, they inserted the Swinton and Mexborough clause, but also made an addition to it which said that the deposit should, subject to its being worked by the use of gas afterwards by the penny-in-the-slot meter, be retained by, and belong to, the Corporation, because if they had to account for it to the consumer, and the consumer had used no gas, they still got no minimum charge to cover the cost of providing the meters. If they dealt with it on the basis of a deposit beforehand, instead of a further payment being made after the end of the quarter, the Committee said that there should be a maximum charge, and that it ought to be provided that the deposit, if not used up by the consumer, should belong to the Corporation. In the Prestatyn Bill as passed by the Committee, it stood so; and they had taken the words from Prestatyn, and put them into their Bill. The filled-in Bill read that—

The Corporation shall be entitled, if they think fit, to require a deposit of one shilling per quarter for a prepayment meter, provided that the amount collected from the prepayment meter during such quarter shall be applied in the first place in refunding the said deposit to the person who has paid the same, and subject thereto the deposit shall belong to the Corporation.

And then that notice of the effect of the enactment should be printed on the meter-card.

The CHAIRMAN: Will the effect of this be that a person who has a prepayment meter in his house is always to be called upon every quarter to pay a shilling deposit?

Mr. KEEN: If he does not use up the deposit, it will be carried forward on to the next quarter.

The CHAIRMAN wanted to know whether the shilling proposed was practically a once-for-all charge which represented the whole of the capital expenditure of the Corporation in putting the prepayment meter into the house, or whether it was looked upon as the rent of the meter.

Mr. KEEN replied that it was not either. It was only a payment on account of the whole charge, and the whole charge included both payment for gas and payment for meter.

The CHAIRMAN: I am talking about the shilling, not the penny.

Mr. KEEN said if they took first the case of a consumer who used more than a shillingsworth of gas every quarter, then the shilling simply went as a payment on account of what the consumer would ultimately have to pay. What he had to pay was calculated on the pennies he put in, and every penny he put in gave him so much for gas and so much for rent of meter.

The CHAIRMAN: I want to put this case to you. Supposing a person comes in and occupies certain premises with a prepayment meter for three months, and pays his deposit and consumes a certain amount of gas, and then leaves at the end of the three months, would the same process be pursued with the person who follows him into the house, and make him give a deposit of a shilling before anything happens?

Mr. KEEN replied in the affirmative.

Mr. BATEMAN HOPE: It is only when the pennies do not come to a shilling that there would be an adjustment of the account, and there would be such an adjustment of account as to leave a shilling in your hands for the next quarter?

Mr. KEEN: Yes.

The CHAIRMAN: I think that meets the point raised by the Home Office.

Clause 25 was passed, as were also clauses 26 to 36, which dealt with the quality of the gas, testing-place, testing for quality, pressure, repeal of certain provisions of Acts of 1867 and 1883, saving as to penalties, power to lay gas-pipes in streets not dedicated to public use, construction and placing of pipes, &c., between mains and meters, fittings let for hire by the Corporation not to be subject to distress, &c., gas consumers to give notice to the Corporation before removing, and notice to discontinue the supply of gas.

Clauses 37 and 38 related respectively to "Supply of Gas where Consumer has Separate Supply," and "Minimum Charge for Gas Laid on to Premises having Supply of Electricity." They were as follows:—

37.—Notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or in any other Act, a person shall not be entitled to demand from the Corporation a supply, or the continuance of a supply, of gas for premises having a separate supply (that is to say, a supply from an installation other than that of the Corporation) unless he shall have previously agreed to pay to the Corporation such minimum annual sum as will give to them a reasonable return on the capital expenditure and standing charges incurred by them to meet the possible maximum demand for those premises; and the minimum annual sum to be so paid shall be determined, in default of agreement, by a Petty Sessional Court.

38.—Where any person has a supply of gas laid on by the Corporation to any premises for which he has at the same time a supply of electricity, either from the Corporation or from his own installation or that of any other person, the Corporation shall, in respect of the supply of gas so laid on, be entitled to receive such minimum charge as shall be fixed by them for each quarter of a year, notwithstanding that the ordinary charge for the gas actually consumed in such quarter would amount to a lower sum.

Mr. KEEN proposed to take the clauses together, and read clause 37.

The CHAIRMAN: That means to say that you want to charge a higher price to certain consumers because they have private supplies of their own which are not sufficient for their purposes.

Mr. KEEN said that was so, because they had private supplies, and they only used their public supply as a stand-by. They kept it by them to be used when their own failed. This was the evil that had to be met; and he would call evidence that it applied considerably in Heywood, though it had been largely recognized as applying all over the country. In the case of electricity, in the first place, under all Provisional Orders for electric supply there was a minimum charge allowed to be made by undertakers to their consumers—he thought it was 13s. 4d. a quarter. In addition to this, the practice of inserting in Private Acts relating to electricity and corporations omnibus Bills a clause of the character of 37, had been recognized. There were many instances; and it was in the Mountain Ash and Watford cases of the present session, before this Committee, in exactly the same form—that where there was a private installation of electricity and the public supply was used as a stand-by, then there might be a minimum charge which was to be ascertained by arbitration. As regarded the application of the principle to gas, this had been recognized in the present session by the other section of the Committee in the Mountain Ash Gas Act, not as between gas and electricity, but as between a private installation of gas and a public gas supply. Counsel read the clause in the Mountain Ash Act, and said it was exactly the same as their clause 37, except that the Arbitration Act, 1889, was provided instead of the Petty Sessional Court. It was given by the other section of the Committee, after evidence of the fact that there were various private installations established, and that a public supply had been used as a stand-by. Of course, the Corporation had not only to provide its capital expenditure for the laying of the mains to the particular consumer's premises, but had also at its works to keep an adequate supply of gas to meet all demands that might be made upon it from time to time—to meet all occasional as well as ordinary demands. If the private installation broke down at any time—of course, a private installation was only provided where there was a very large consumption of gas—they came at once on the public supply; and this supply had to be there ready. Instead of the Petty Sessional Court, he would prefer to put in arbitration by a person to be appointed by the Local Government Board. They were quite willing to accept arbitration under the Act of 1889; but if the Committee thought fit, they would put "arbitration by a person to be appointed by the Local Government Board."

The CHAIRMAN intimated that the Committee would consider the alteration of the clause after they had heard the evidence.

Mr. KEEN proceeded to explain that clause 38 was an extension of this principle, which, so far as he knew, had not yet come before the Committee. Clause 38 was not to apply merely where there was a private installation and the public supply was used as a stand-by, but it was to provide for where originally there had been a gas supply laid on, and then the electricity supply from the public works was taken for the purpose of ordinary consumption, and the gas was still retained as a stand-by; but instead of its being a private gas installation, it was a public supply.

The CHAIRMAN: It might be both.

Mr. KEEN said in any case it was an electricity supply by a private works, or by a public supply, or by both of them; and the same principle was to apply. It must be an injustice that the Corporation should have to keep their works open at large expense without securing any return for the money.

The CHAIRMAN pointed out that there were a very large number of people who used electricity from the Corporation's supply, and took gas constantly as an adjunct—say, for cooking purposes. Many cases of this kind certainly occurred among the poorer class of houses; but it seemed to him this clause might convey the possibility of charging a higher price for gas so consumed.

Mr. KEEN said that if a reasonable minimum were fixed this could not apply, because the use of gas for cooking purposes, &c., would reach the minimum. If the minimum were a reasonable one, he thought no injustice would arise. The wording as it stood was, "Shall be fixed by them;" and this was reported against by both departments, he thought—at all events, by the Local Government Board. They quite agreed that some alteration should be made there—either that the minimum might be expressly provided in the Bill, or else that the form of the clause might be altered to correspond with clause 37. It might be left to be fixed by arbitration; but having regard to the fact that in the Electrical Provisional Orders a minimum charge was in all cases given, they suggested that it might be reasonable here to fix a minimum charge, and put it in the Bill. The promoters would be quite willing to accept either such an expressed minimum as the Committee might put into the Bill, or to alter it to the form of arbitration under the Act of 1889.

Mr. *E. H. Stevenson* was then called to state to the Committee the reasons why he considered clauses 37 and 38 embodied generally a principle which it was right to apply to a corporation carrying on a gas undertaking. Witness handed in a diagram applying to one firm on clause 37. Generally speaking, they had power gas, and did not use any other since this had been installed. But over a period of three years, they did use gas up to the maximum of 177,000 cubic feet. This was a consumer at a mill in Heywood. During 1904 and 1905, they used this gas; but none in 1903. In 1905, 107,000 cubic feet of gas out of 184,000 feet was used in two months for power. Their installation of gas for this firm was an insurance on their profits. Without the Corporation giving them gas, they would have to put in duplicate machinery, and provide capital. The Corporation or the town, through the Corporation, were insuring this firm at the cost of the town; and that was why they asked for the clause.

Mr. PEARCE: That amounts to a monopoly of the supply of gas. You are bound to supply gas to anybody who wants it?

Witness: That is so.

Then why should you want any more than that?—Because we are bound to connect our mains to anybody who wants gas, whether they take it or not. This mill is so connected to our main that year after year they do not take any gas.

Replying to further questions, witness said they were bound to connect, whether the gas was used or not. They were bound to keep up the pressure, and also to expend their capital at the works so as to give a supply.

Mr. PEARCE: But then the Corporation do this as a security—not for

the individual proprietor that you speak of, but for the general convenience of the town.

Witness: Not at all. I have got works which will supply, we will say, 100 million cubic feet of gas a year; and I have attached to my mains consumers who might possibly come upon me for another 100 millions. This means that the people who are burning the gas have to pay extra for those who only want it as a stand-by.

The Chairman : It seems to me, as you are bound to supply everybody and take the risks of a small demand or a large demand, so you might equally raise the price of gas to all your consumers to cover this particular point?

Witness: That is exactly what we have done; and the other consumers are paying for this capital.

Then really the position is this, that you want to lower the price of your gas to the ordinary consumer in order to make the person who does come upon you in this way pay what you consider to be his fair share of the capital?—Yes; and just a few standing charges.

Mr. Jowett: Is it your view that Parliament has protected gas undertakings against risks of insufficient usage, according to the necessities of the case up to now, and you want to extend the same principle by putting in a protection to cover these consumers?

Witness: They have done it in electricity, and now we want it in gas.

Mr. Keen : Parliament has done it, too, in the case of water, has it not?

Witness: Yes; and in this session in fact, in one case with gas.

In further examination, witness said that what they asked now was that they should not be bound to keep a lot of dead capital simply because somebody came and said he required to be put on their system. As to capital lying dead, he thought they could make at least 50 per cent. more gas than they did now. They had lost these mills, and they had lost mills by electricity in the same way; and the capital was lying dead in consequence of this.

Mr. Pearce : Supposing this goes on spreading, and everybody uses power gas and electricity, you will be drawing annual sums from everybody on your dead plant?

Witness: No, because if everybody used his own electricity and power gas, he would not ask us to put him on to our system. It is only when people demand that they shall be put on to our system, or that they should remain on our system, that we ask this.

Mr. *Walter Whatmough*, the Gas Engineer and Manager to the Heywood Corporation, examined by Mr. Keen, said if they took the period of ten years from 1898 to 1908, the total quantity of gas manufactured by the Corporation had increased from 114 million cubic feet to 141 millions. Notwithstanding this total increase, the quantity supplied to mills and workshops had decreased in this period from 29 millions to 24 millions—a decrease of 16·2 per cent. In his town, there were various cases where a gas supply was laid on and used simply as a stand-by—the owners of the premises getting a supply from their own private gas installation works, or from the electricity supply. In his opinion, the circumstances were such that the Corporation ought to be entitled to charge a minimum sum to these people for a stand-by supply.

Mr. Keen : If such a charge is not made, is there an expense to which the Corporation are put by carrying increased works for the purpose of their undertaking charged to other consumers of gas?

Witness: Yes; for this reason. The greater the disparity in the consumption, the greater the cost. The more constant the supply you can give to a consumer, the less is the cost of the capital charges. We have to provide capital for these undertakings; and by sudden demands coming on of this character, it makes it much more costly for the fixed and the stand-by charges of the concern. A spasmodic supply not only has to be provided for, but the providing for it is more costly than for a regular supply. The diagrams Mr. Stevenson has put in correctly illustrate what has happened in particular cases in my town.

Witness then put in the following diagrams and statements showing the quantity of gas that had been taken in each of four cases.

Stand-by Charges.—Particulars of Irregularity of Demand for Gas Supply by Users of Private Gas Installations.

Diagram No. I.

Year.	Annual Consumption. Cubic Feet.	Year.	Annual Consumption. Cubic Feet.
1895.	54,600	1902.	*nil*
1896.	91,800	1903.	*nil*
1897.	63,600	1904.	125,700
1898.	16,800	1905.	184,100*
1899.	1,600	1906.	*nil*
1900.	*nil*	1907.	*nil*
1901.	*nil*	1908.	*nil*

* Note.—107,000 cubic feet of this quantity consumed in two months.

Diagram No. II.

	Quarterly Consumption. Cubic Feet.		Quarterly Consumption. Cubic Feet.
December, 1907	800	September, 1908	139,600
March, 1908	27,200	December, 1908	2,700
June, 1908	9,100		

Stand-by Charges.—Particulars of Irregularity of Demand for Gas Supply by Users of Electricity.

Diagram No. III. (Plain line).

Year.	Annual Gas Consumption. Cubic Feet.	Year.	Annual Gas Consumption. Cubic Feet.
1895.	327,000	1902.	57,000
1896.	101,000	1903.	72,000
1897.	50,000	1904.	313,000*
1898.	57,000	1905.	32,000
1899.	101,000	1906.	35,000
1900.	101,000	1907.	30,000
1901.	60,000	1908.	42,000

* Note.—222,000 cubic feet of this quantity consumed in three months.

Diagram No. III. (Dotted line).

Year.	Annual Gas Consumption. Cubic Feet.	Year.	Annual Gas Consumption. Cubic Feet.
1901.	840,000	1905.	312,000*
1902.	728,000	1906.	16,000
1903.	70,000	1907.	20,000
1904.	59,000	1908.	18,000

* Note.—270,000 cubic feet of this quantity consumed in three months.

Answering Mr. Keen, witness said Nos. I. and II. were cases where the private supply was a power-gas installation. In 1895, the supply was 54,600 cubic feet; in 1896, 91,800; in 1897, 63,600. This was after the power-gas installations were fixed. The diagrams dated from the time the installation was connected. During the first three years, there was some little gas still taken. In 1899, it went down to 1600 cubic feet in the year; and for four years there was nothing taken at all. In 1904, they suddenly had a demand for 125,700 cubic feet, and in 1905 a further demand for 184,100 cubic feet, which represented the consumption for the whole of the year. In 1905, 107,000 cubic feet was consumed in two months (October and November). The breakdown of the plant was the cause of the sudden demand in these two years. In the last three years (1906 to 1908), they had no supply at all. Diagram No. II. was a recent installation, laid on in December, 1907. Then they had 800 cubic feet; in the March quarter, 27,200 feet; June quarter, 9100 feet; September quarter, 139,600 feet; and in the December quarter, only 27,000 feet. The reason of the 139,600 feet in September was in the case of a breakdown of the plant. Diagram No. III. showed cases where the separate supply was electricity. The growth from 114 million cubic feet to 141 millions had been gradual. Of

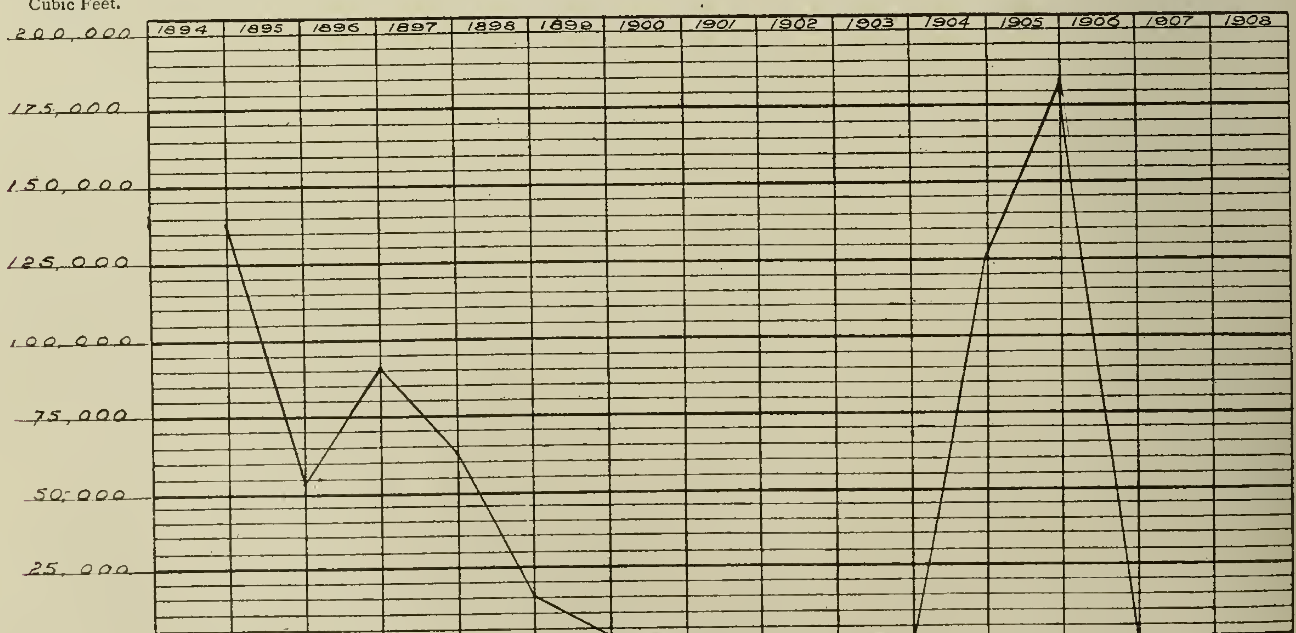


Diagram No. 1.—Showing Irregularity of Demand for Gas Supply by Users of Private Gas Installations.

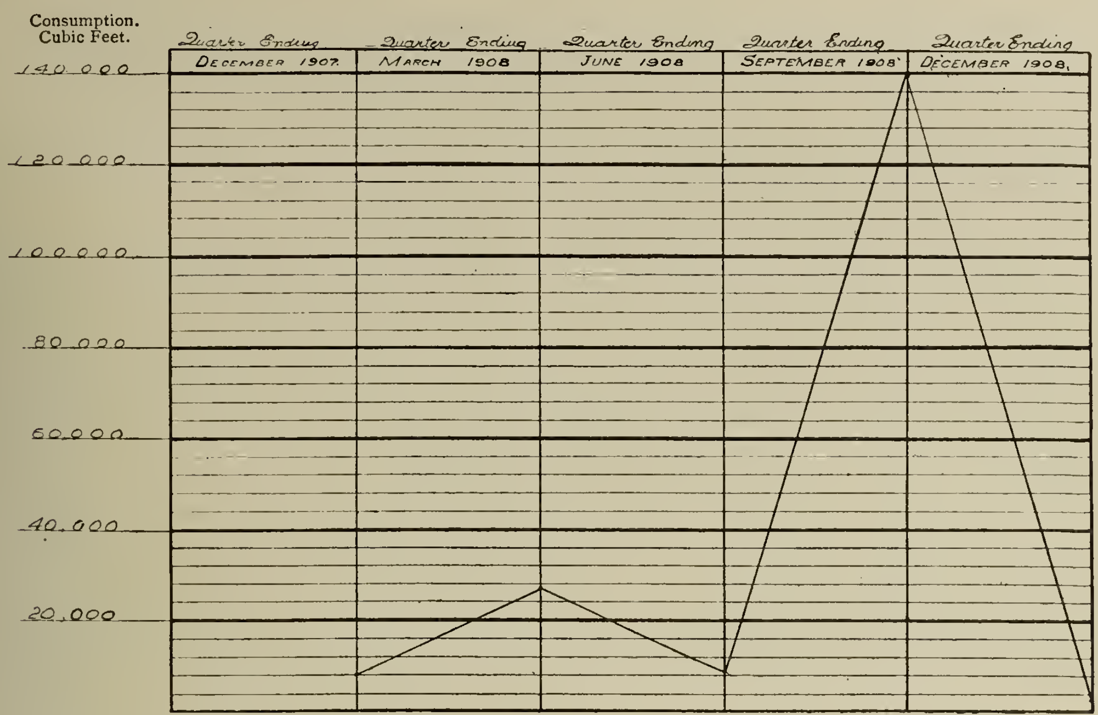


Diagram No. 2.—Showing Irregularity of Demand for Gas Supply by Users of Private Gas Installations.

course, they had had to make great efforts for consumption in their gas-stoves and appliances; and they had pushed this trade very much. This was one of the reasons why they had got the 141 millions. The gas-stoves were used chiefly by householders in a domestic way. The increase in lighting for this period had only been 6·6 per cent. Their gas trade was increasing all the while; but they had lost on mills and workshops due to electricity.

The CHAIRMAN: Of course, you have gained more than you have lost?

Witness: Yes; but we have had to push the trade and expend the capital for it.

Mr. PEARCE: If a mill broke down, you could refuse a supply, which is the object of your clause, and you would throw out of work how many hands—it would depend on the size of the mill, I suppose?

Witness: Yes; perhaps 500.

So that if they could not use the town gas supply, you would find yourselves with 500 people out of employment while the breakdown was being repaired; and that might last three months, according to your figures?—Of course, the Gas Committee thought it was only fair that, having to make special provision in the case of emergency, there should be some recompense, which is why the matter has been brought forward here.

Practically you are increasing your gas supply owing partly to your own energy, but partly to the growth of the town?—Yes; but more to the pushing of the business and to the development of the population. Within this period we have increased in gas-stoves alone 872; in the smaller stoves, 2085; and in other appliances, 1398. It has been by pushing the business and expending capital that we have increased our consumption.

Do you understand that, if you have this clause, on a breakdown you might say: "You have never paid us anything, and we shall not give you any gas?"—We should not like to be so ungenerous; but we think they ought to give us some recompense for the privilege.

Continuing, witness said that in 1898 their capital, less the capitalized value of the annuities, £53,000, was £81,324, or £713 per million. Ten years later, in 1908, it was £87,744, or £620 per million. During this period of time, in ten years they spent £6419; and it only cost them £226 per million. The capital expenditure principally went in new mains and prepayment meters. The amount for the latter was £3209.

Replying to Mr. HOPE, witness stated that altogether about 14 or 15 employers or workshops took gas during that period, or had it as a stand-by. He believed that the total amount of gas which the whole 14 or 15 took during a series of years was about 7 million cubic feet. He should say 5 per cent. of the whole consumption they had lost now through electricity; and he was speaking of electricity in this case—of mills which had adopted electricity in connection with the gas supply. About 14 mills or manufactories would come under the two clauses 37 and 38. Not more than about ½ per cent. of the total production of gas was used by these manufacturers. Heavy demands had occurred; but it was not beyond their power to meet them. They always had to meet emergencies, and had to have increased retort power as a stand-by. They had 30 per cent. of margin of retort power now.

Mr. HOPE: Taking one of these firms who sometimes use nearly a million cubic feet in the year, can you give any idea how this charge would work out under section 37 or 38?

Witness: In the case of mills like that, I should not like to exercise a charge higher than £5 as a payment for the privilege. I would suggest that it should be put in the clause.

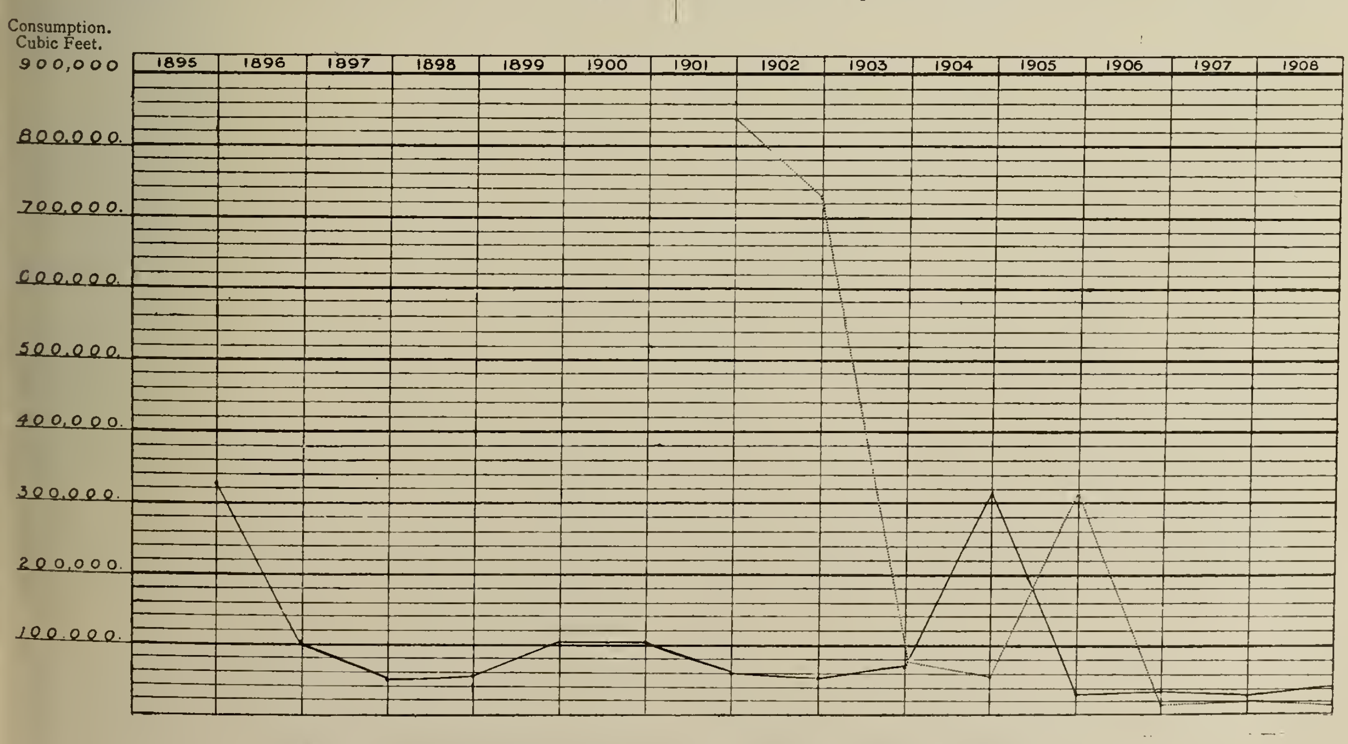


Diagram No. 3.—Showing Irregularity of Demand for Gas Supply by Users of Electricity.

Mr. KEEN: We should certainly be willing to put this figure in.
Mr. HOPE: Not exceeding in any case £5 a year?
Mr. KEEN: Yes.
The CHAIRMAN understood that the Local Government Board had no objection to this.
Mr. BOYCE mentioned that in their report upon clause 37 they said: "This is an exceptional clause in regard to the supply of gas. The Corporation are protected by section 11 of the Gas-Works Clauses Act, 1871, in respect of capital expenditure incurred in the laying of pipes, and it appears to the Board that the clause should not be allowed."
The CHAIRMAN, after consultation, said the Committee approved of the principle which was laid down in clause 37; but they wanted to alter the clause. They thought it had better be struck out, and that a new one should be brought in containing power to charge a minimum annual sum not exceeding £5. He would leave Counsel to draw up the clause to carry this into effect, and they could discuss it again when the matter came up afterwards.
Mr. KEEN: Is that to cover the principle of clause 38 as well?
The CHAIRMAN: No; I limit that to clause 37 only. Clause 38 raises a new question; and we ought to discuss that, too. Of course, the £5 would not be taken off the gas account—the amount to be charged for actual consumption; but it would be like a retaining fee, as I think one of the witnesses put it.
Mr. KEEN: This will be in addition to the charge made for the actual supply of gas.
The CHAIRMAN agreed, and, addressing Mr. Keen, he said that in re-drafting the clause the Committee wanted him to arrange it so that the charge of £5 would not fall upon the small consumer.
Clauses 37 and 38 were then ordered to stand over.
Clauses 39 and 40, dealing respectively with "power to require use of anti-fluctuators for gas-engines," and "period of error in defective meters," were passed.

Tuesday, June 29.

In the course of to-day's proceedings,
Mr. KEEN stated that they had now re-drafted clauses 37 and 38, and asked the Committee to take them into consideration.
The CHAIRMAN: Clause 37 must go out and a new one be brought in.
Mr. KEEN read the new clause as follows:—

Where any person has a supply of gas laid on by the Corporation to any premises for which he has at the same time a supply of gas from an installation other than that of the Corporation, the Corporation shall be entitled to receive from him, as a standing charge, in addition to the charge for the gas actually supplied to him, a fixed sum to be determined by them, but not exceeding 25s. for any quarter of a year. Provided always that in determining such fixed sum the Corporation shall have regard to the probable maximum supply of gas which might at any time be required for such premises, and provided also that the Corporation shall not be entitled to any such standing charge as aforesaid in respect of any premises for which the whole supply of gas afforded by them is taken through a meter having a nominal capacity of less than ten lights.

Mr. KEEN: Mr. Boyce has raised one point upon the drafting, as to whether it would be better that it should be a fixed annual sum.
Mr. BOYCE: It will not affect the clause. The sum fixed is an annual one, then you may calculate it as you like.
Mr. KEEN: I think it would be interpreted so, because it says, "not exceeding 25s. for any quarter;" but there is no harm in adding "quarterly" after "fixed"—"supplied to him a fixed quarterly sum," so that it should be one fixed sum.
Mr. BOYCE said the sum that was fixed was the annual amount. The mode of payment might vary—the quarterly payments might vary. This amount had got to be paid each year. It was not one payment but was to go on for ever and ever. But they might calculate it as a quarterly payment as they liked.
After discussion, the words were agreed as follows: "A fixed sum to be determined by them not exceeding £5 per annum."
The new clause 37 was passed as amended.
Mr. KEEN next read the new clause 38—"minimum charge for gas laid on to premises having supply of electricity."

Where any person has a supply of gas laid on by the Corporation to any premises for which he has at the same time a supply of electricity, either from the Corporation or from an installation other than that of the Corporation, the Corporation shall be entitled to charge, and receive from him in respect of the supply of gas so laid on, such minimum sum as shall be fixed by them not exceeding 25s. for any one quarter of a year, notwithstanding that the ordinary charge for the gas actually consumed in such quarter would amount to a lower sum. Provided always that, in fixing the amount of such minimum charge, the Corporation shall have regard to the probable maximum supply of gas which might at any time be required for such premises. Provided also that in respect of any premises for which the whole supply of gas afforded by the Corporation is taken through a meter having a nominal capacity of less than ten lights, and the supply of electricity is taken from the Corporation, no such minimum charge shall be made, and provided also that in respect of any premium for which the whole supply of gas afforded by the Corporation is taken through such a meter as aforesaid, and the supply of electricity is obtained from an installation other than that of the Corporation, the amount of the minimum charge shall not exceed 5s. for any one quarter of a year.

New clause 38 was passed; and the other two clauses were struck out of the Bill.
The CHAIRMAN assumed it was always optional to take a prepayment meter. The Corporation did not force it upon people?
Mr. KEEN said they could take whichever they liked, or neither.
Mr. HELME (a Member of the Committee): The Committee would desire to protect the consumer, so that if any consumer thought he could purchase his gas more economically through the ordinary meter he should be perfectly free to demand one from the Corporation.
Mr. HUTCHINSON: He has that right under the Gas-Works Clauses Act. He can come and demand to be supplied through an ordinary meter.
The CHAIRMAN pointed out the difficulty the Committee felt. They were regulating their cost of gas through these prepayment meters on the assumption that they had got to pay the interest and sinking fund charged on each prepayment meter put into a house. He did not know how long it would take to work off the cost of a prepayment meter; but it was quite clear that where there was a slot-meter they would still have the right to charge this price for gas for which there would be no necessity—the prepayment meter having been paid for.
Mr. KEEN said it was a question as to how long the prepayment meter lasted, and how soon it had to be replaced. He understood it cost about £2; and then there was the fixing and extra cost of collection.
The CHAIRMAN: I do not know what the average life of a meter is. It may last twenty years; and if it lasted this time, it is quite obvious you would be making an extra charge for gas to which you would not be entitled.
Mr. JOWETT: In fixing 10d. per 1000 cubic feet as the extra amount to be charged for these meters, what average consumption have you in mind? Evidently it depends upon what the consumption is as to whether a man is paying more than he ought or less.
Mr. *Whatmough*, recalled, said his estimate of the average life of a prepayment meter was about ten years. They only had five years guarantee from the makers. The average cost of prepayment meters now in use was practically £2, which included fixing. There was the cost of collection also.
By Mr. HELME: The average consumption throughout the year for meters continually in use for twelve months was 8000 cubic feet. This would be £1 8s. 8d., at 3s. 7d. per 1000 feet, as against their ordinary price of 2s. 9d.
Answering the CHAIRMAN, witness said 2s. 9d. per 1000 feet was the ordinary price, and they charged 10d. per 1000 feet now in all cases for meters only, and also for meters with stoves; so that, under clause 25 of the Bill, upon meters only they would lose 2d. per 1000 feet.
Mr. HELME: Do you supply a fixed number of feet to prepayment meters for 1d., and vary the quantity when there is a cooker supply, or do you not take one universal number of feet for the 1d.?
Witness: It is a universal number of feet throughout—23 cubic feet for 1d. Continuing, he said that in Heywood it was the custom of owners of property to provide the meters free; so that the tenant, having the meter free of charge, could go on to the prepayment meters, and paying 10d. per 1000 feet extra was really a very heavy price. They had never charged meter-rents except in very few cases. He did not think they had any more than perhaps two dozen cases in the town. They charged meter-rent when the Corporation supplied; but it was the custom for the owner to put in the meter. He took it that they would have power to abolish meter-rent charges in the Bill.
Part IV. of the Bill was then passed.

West Gloucestershire Water Bill.

This Bill came before the Unopposed Bills Committee of the House of Lords last Tuesday, when a petition was presented by the Bristol Water-Works Company praying to be heard against an addition which the promoters sought to make, repealing certain sections of their previous Acts. After hearing Mr. John Kennedy (instructed by Messrs. Edward Gerrish, Harris, and Co.) on behalf of the Company, and Mr. Pritt (instructed by Messrs. Stanley, Wasbrough, and Doggett) on behalf of the promoters, the Committee decided that the proposed addition must be either struck out or the Bill sent to an Opposed Bills Committee. The promoters elected to adopt the former course, and the proposed addition was struck out.

LEGAL INTELLIGENCE.

A GAS MANAGER CONVICTED OF THEFT.

The Prosecution at Margate.

At the Margate Borough Police Court last Friday, Mr. Frank A. Winstanley, Manager and Engineer of the Isle of Thanet Gas Company, appeared on the adjourned charge (*ante*, p. 52) of having, between June 19 and 26, stolen a postal order for 7s. 6d., the money of his employers.

Mr. H. K. DANIEL prosecuted on behalf of the Company; Mr. GILL DAVIES appeared for the prisoner.
Mr. DANIEL said that, as during the past few months postal orders sent to the gas-works had been disappearing, the matter was placed in the hands of the police; and the Chief Constable sent the postal order for 7s. 6d., the subject of this charge, with a fictitious account. The postal order never reached the proper quarter at the works; but it was traced as having been changed by the prisoner at the Nayland Rock Hotel. Though the amount was small, the case was viewed as serious, owing to the position of trust held by the prisoner.
Mr. *Thomas C. Fuller*, Secretary to the Company, said the prisoner had been Manager and Engineer of the Works Department at the gas-works for over four years, at a salary of £360. Letters delivered by the postmen were put in the letter-box at the main door of the works. The box was kept locked, and the prisoner was one of three persons possessing a key. The letters were generally taken out by one of the clerks, and after being sorted were sent to the department to which they referred. It was no part of prisoner's duty to receive money or give any receipt for money received, nor was he (witness) aware that he had done so.
In reply to Mr. DAVIES, witness said prisoner was entitled to open the letter-box at any time; and as Manager of the works it would be no unusual thing for him to open the box in order to see what correspondence arrived. It would not be improper for him to open correspondence in the evening or on Sundays.
Chief Constable *Appleyard* proved sending the order for 7s. 6d., with a fictitious account, as explained at the previous hearing.
Constance Morgan, barmaid at the Nayland Rock Hotel, repeated her statement as to changing the order for the prisoner, who was known to her as an occasional customer at the hotel. This was the only postal order she had changed for him. She paid the order in with her takings

the next morning. *R. K. Kemp*, Overseer at the Margate General Post Office, produced the order in question, which had been paid into the post office by the London and County Bank. Mrs. *Foreman*, wife of the proprietor of the Nayland Rock Hotel, proved receiving the postal order from the barmaid. Mr. *Chassel*, cashier at the Margate Branch of the London and County Bank, said that on June 22 the order was paid in to Mr. Foreman's account.

This concluded the evidence for the prosecution.

Prisoner was then formally charged, and pleaded "Not guilty."

Mr. Davies said that, while admitting all the facts, he submitted to the Bench that the order was not taken with any intention of stealing it. He contended that, in the discharge of his duties, the prisoner took the order, and, through gross carelessness, he put it into his pocket. Being out in the evening, he, while under the influence of drink, and being short of money, changed the order, intending to pay in the money next morning. However, owing to his muddled condition, he forgot it. In consequence of the prisoner's drinking habits, his brain had become sodden, and he was incapable for the time being of ordinary rational thinking, and so forgot the order.

The Magistrates said there would be a conviction in this case.

Prisoner was then charged with stealing a postal order for 3s. 6d., the money of the Company, between May 1 and June 30.

Mrs. *Healey* said that on May 1 she sent a postal order for 3s. 6d. in payment of an account for the hire of a gas-stove. The account was rendered a second time, and she wrote to the Company sending the counterfoil of the order.

Mr. *A. E. Johnstone*, Collector to the Gas Company, proved that the order was not paid in to the proper department.

Kate Morris, barmaid at the York Hotel, Margate, said that on June 22 she changed a postal order for 3s. 6d. for the prisoner. It was paid in to the London City and Midland Bank.

Mr. *Edward Payne*, Clerk at the London City and Midland Bank, proved the paying in of the order.

The Magistrates stated there would be a conviction in this case.

Prisoner was then further charged with stealing a postal order for 12s. 6d., the money of the Company.

Evidence was given to the effect that this order was sent by the Chief Constable, with a fictitious account for gas supplied, on Saturday, June 26. On Sunday evening, a constable secreted on the premises saw prisoner go to the letter-box, take out the letters, and walk into the office. Shortly afterwards, he returned and placed some letters in the box. When he had left the premises, the constable went to the office, and found the empty envelope of the letter posted the previous evening. The postal order was found on prisoner when arrested.

Prisoner was also convicted on this charge. There was a fourth charge which was not proceeded with.

Mr. Davies then made a powerful appeal to the Magistrates on prisoner's behalf. He pointed out the punishment he had received by being dismissed from his situation, and asked the Bench to deal with him as a first offender—or at all events to inflict a fine, and not add to his degradation by sending him to prison. He contended that he was in his present position, not through any criminal intention, but owing to gross, wanton, wicked, careless, and drunken folly; and he reminded the Magistrates that in his fall he did not fall alone, as he had an aged mother and a wife.

The Magistrates retired to consider the cases; and on returning into Court,

The Chairman said they considered the case too grave, having regard to the position of trust prisoner occupied, and the ample salary he received, to take the course suggested by his advocate. Prisoner would be sentenced to two months' imprisonment in the second division.

CONSTRUCTION OF UNAUTHORIZED WATER-WORKS.

High Court of Justice—King's Bench Division.—Wednesday, July 7.

(*Before Mr.* Justice Ridley.)

His Lordship heard this morning the concluding proceedings in an application made the preceding day by the Attorney-General for an injunction to restrain the Barnet District Gas and Water Company from constructing, or using, upon a piece of land acquired by them at Colney Heath, "a well or other works for the purpose of raising, collecting, or storing water, and from carrying the same away for the purpose of their general undertaking." The action was brought by the Attorney-General at the relation of the Marquis of Salisbury, who is the tenant for life in possession of Hatfield House, which includes nearly the whole of the town of Hatfield and the village of Essendon, and who has had for many years upon his estate wells which supply the town with water. The defendant Company were incorporated by Act of Parliament in 1872 for the purpose of constructing and maintaining works, acquiring lands, and supplying water to certain parishes and places in the counties of Hertford and Middlesex. By an Act obtained in 1904, they were empowered to construct a reservoir and make certain subsidiary works; and by section 15 it was provided that if the reservoir was not completed within three years from the passing of the Act, the powers granted by it should cease. But nothing therein contained was to restrict the Company from at any time renewing, extending, enlarging, altering, reconstructing, or removing certain of their existing works, increasing or improving the supply of water, or exercising any of the powers with respect to the construction of works from time to time as occasion might require. The Company had acquired a piece of land at Colney Heath, and had commenced to sink a well for the purpose of obtaining a new water supply. It was alleged that this well was outside their statutory powers, and that its construction would cause damage to the relator. It was also alleged that the works authorized by the Act had not been completed within the prescribed period; though this allegation was denied by the defendants.

Sir Alfred Cripps, K.C., Mr. Danckwerts, K.C., and Mr. Eustace Hill appeared for the plaintiff; Sir Robert Finlay, K.C., Mr. Balfour Browne, K.C., and Mr. J. D. Crawford represented the defendants.

Sir Alfred Cripps, in opening the case, said the question raised by the Attorney-General was that in doing as they had done the Company had acted *ultra vires*; and the defence would turn upon the construction of certain words in the Act. Two cases had recently been decided in the Chancery Division which apparently governed the present case. The Attorney-General was acting on the relation of the Marquis of Salisbury; and his complaint was with reference to a well which the Company were seeking to construct, as they submitted, under the powers of their Act of 1904, for the purpose of supplying water. It had recently been decided that water companies had no authority to construct wells under the general powers conferred by the Water-Works Clauses Act, 1847, except as ancillary to, or as part of, the actually authorized works, because if it were otherwise an immense amount of harm would be done to particular districts by draining the existing wells without parliamentary notice being given to the parties concerned. His submission was that there was no power given to the Company to sink a well at Colney Heath, which was 6½ miles from the nearest "authorized works," except as part of their authorized water-works, which it was not; and no power was conferred by the Water-Works Clauses Act to people to wander about a particular district, purchase lands, and afterwards set up works drawing water from an unauthorized source. He could not possibly see how the present case could be distinguished from the Frimley and East Grinstead cases.* Having at some length referred to the decisions in these actions, Counsel submitted that they clearly bore upon the present case; and he pointed out that in the Act the definition of "water-works" was "the specified water-works."

Sir Robert Finlay said he agreed that the Frimley case was correctly decided, but he contended that it had no application to the case before the Court, which was of a totally different character. The Water-Works Clauses Act was framed for the purpose of being adopted as a sort of schedule to any Special Act, so as to save the trouble of introducing particular clauses for the purpose of authorizing water-works. It was supposed that the effect of section 12 of the General Act was to enable a company to sink wells on land acquired, though the undertaking and deposited plans showed wells at other points. At one time it was doubted whether this was correct; and that these doubts were shown to be absolutely well founded was proved by the Frimley case, in which it was decided that the general incorporation of the Water-Works Clauses Act did not, by virtue of section 12, authorize the Company to sink any wells other than those authorized by the Special Act. The defendant Company's Act of 1904 incorporated the general words of the Water-Works Clauses Act; but, inasmuch as it was recognized that there was a doubt as to whether section 12 of the Act could have any effect, the Special Act went further, and enabled the Company to acquire land at Colney Heath for the purpose of their water-works undertaking.

Justice Ridley: Stopping there, you are clearly out of Court.

Sir Robert Finlay said no doubt that was so; but the Act went on to provide that the Company might, upon the land so acquired, carry out any of the works and execute any of the powers mentioned in, or conferred by, section 12 of the General Act. This had exactly the same effect as if there had been set out in terms the various things specified in section 12 of the General Act.

Justice Ridley remarked that the power was "in connection with the water-works."

Sir Robert Finlay said these words meant for the purpose of getting water to be supplied within the district. In the Frimley case, there were no such words.

Justice Ridley asked whether the contention was that the Company might make reservoirs which were not shown on the deposited plan.

Sir Robert Finlay said it was.

Justice Ridley: That will not do at all.

Sir Robert Finlay: The whole question is: Has Parliament authorized this or not?

Justice Ridley: Certainly not.

Sir Robert Finlay: Then it is of no use arguing it further. I will never waste the time of the Court by arguing a case if the learned Judge has made up his mind; but if your Lordship's mind is still open, I will continue my argument.

Justice Ridley said no one was infallible; and therefore he would try to keep an open mind on the subject.

Sir Robert Finlay then proceeded to call attention to the points of difference between the present case and that of the Frimley Company, and he argued that power was conferred on the Barnet Company to do on the land acquired anything authorized by section 12 of the Water-Works Clauses Act, which included the sinking of a well. If additional lands were acquired in Middlesex, the Company could not sink wells under the provisions of section 11; but they might construct a reservoir to be supplied with water from Hertford. There was nothing in the deposited plans about a reservoir in Middlesex. This was a conclusive answer to the argument that Parliament had not granted power to do anything not shown on the deposited plans. Section 12 enabled the Company to purchase land outside the limits of supply for the purpose of sinking wells to obtain water; and if there was power to construct works at Colney Heath, there was power, under section 28 of the General Act, to lay the necessary distributing-pipes. In the East Grinstead case, it was decided that there was no power to break up the streets to convey water from an unauthorized source of supply; but in the present case, the source was authorized. Counsel further asked the Court not to grant an injunction, which was an entirely discretionary matter, as there had been a special agreement between the relator and the Company, before the Parliamentary Committee, that power should be given to sink the well in question; though whether this agreement had been properly incorporated in the Act was another matter. With a view to showing that there was such an agreement, he proposed to read what took place before the Committee.

Mr. Danckwerts objected to this, on the ground that the relator was no party to the action. He submitted that all the Court had to consider was what was in the Act of Parliament, not the question of any agreement.

Justice Ridley asked Mr. Danckwerts to deal with the points raised on sections 11 and 12.

* See "Journal," Vol. CI., pp. 636, 843; and Vol. CIV., p. 505.

Mr. DANCKWERTS contended that these sections were only inserted for the protection of two local authorities, and that many of the provisions were *ex abundanti cautela*.

Justice RIDLEY said that, having carefully considered the authorities cited, he was unable to come to any other conclusion than that he was bound by them. Section 10 of the Special Act of 1904 provided that the Company might, by agreement, purchase land for the purpose of the water undertaking, within the limits of supply, not exceeding in the whole 15 acres; and section 30 in the Frimley Company's Act set forth that the Company might, by agreement, purchase and hold for the purpose of that Act, and for the general purposes of their undertaking, any lands within the limits of supply not exceeding in the whole 5 acres in extent. He could not see any distinction between the words of the two Acts. Then came the words upon which Sir Robert Finlay relied in order to show that a wider power was conferred by the section than was given by section 30; and they were these: "And they may, on all or any of such lands, execute, for the purpose of, or in connection with, the water-works, any of the works, and exercise any of the powers mentioned in, or conferred by, section 12 of the Water-Works Clauses Act." It was contended that under these words it was competent for the Company to make new works not connected with the water-works, and put down distinct wells and works which had nothing to do with the former ones. Had the matter been free from previous decisions, he should have hesitated very much before allowing such an argument to prevail, seeing that the words were limited by "for the purpose of, or in connection with, the water-works." It was impossible to read these words otherwise than as meaning that the land was to be bought for the purpose of carrying out any of the works authorized—such ancillary works as were connected with the water-works—but not otherwise. Section 12 related only to specific works on specific sites, which were identified when the Bill was applied for. Parliament did not grant authority to the Company to erect works in such portions of a considerable area as they might think fit, without reference to the deposited plans. At first he had been rather puzzled to see what effect sections 11 and 12 had on section 10; but there was no doubt they were put in for the protection of the County Councils of Middlesex and Hertford. This being so, it was not for the Court to enlarge these powers. He was clearly of opinion that there was no power under section 10, which was the governing section, to construct the well in question. It had been said that there was some intention of getting rid of opposition to the Bill by making an agreement before the Parliamentary Committee with regard to the execution of these works; but with this he had nothing to do. All he could say was that the Act of Parliament had not carried out the agreement referred to. Under these circumstances, he must grant an injunction to prevent the defendants constructing the well; and they must also pay the costs.

Mr. CRAWFORD asked that the operation of the injunction might be stayed pending an application to the Court of Appeal.

Justice RIDLEY said he would grant a stay, provided the defendants would undertake to stop the work at the well.

Mr. CRAWFORD said he was quite willing to give this undertaking. Notice of appeal would be lodged within seven days. He asked that the plaintiff should be ordered to pay the costs of the issue that the works had not been completed within the specified time. He pointed out that no evidence had been given in support of this issue, though the defendants had been put to considerable expense by bringing witnesses to rebut it.

Justice RIDLEY said the Taxing Master must deal with this matter. It was not for him to give any direction.

A Deal in Incandescent Mantles.

In the Shoreditch County Court, last Tuesday, before his Honour Judge Bray, Samuel Mundler, of No. 37, Snow Hill, E.C., gas-mantle manufacturers' agent, sued the Robin Gas-Mantle Works, Limited, of Garrett Green, Tooting, mantle manufacturers, to recover £11 10s. 8d., which included a sum of £5 17s. 6d. loss of profit on the sale of 19 gross and 7 dozen gas-mantles, at 6s. a gross. There was a counterclaim for £17 19s. 10d., the value of mantles ordered by the plaintiff, but refused to be accepted by him. Plaintiff said he ordered 25 gross of "BBB" mantles from the defendants, at 24s. a gross, for resale; but when he received a portion of them, they turned out to be "seconds." He, of course, declined to accept them, claimed his money back, and declined to take the rest. The "BBB" mantles used to be sold by the Block Light, Limited, and were a standard quality, well known throughout the trade; but those sent to him had no shape and were rubbishy, though they were marked "BBB" Mr. Morle, for the defendants, said he could prove that the mantles were the same as those originally sold to Block Light, Limited. Mr. H Garrard, of the firm of Messrs. J. W. May and Co., examined the two sorts of mantles produced, and said one was cotton and the other ramie. The latter was the cheaper material, as cotton contained more thorium, and therefore gave a better light. He would not like to give more than the "seconds" price for the mantles supplied to the plaintiff. Mr. Robin was called, and stated that both ramie and cotton mantles were sold as "BBB." When mantles turned out a bad shape, they were put in "Daslight" boxes, and sold as "seconds." He could not see how the "seconds" got into the "BBB" boxes, unless they were purposely put there. The Manager of the firm for whom the mantles were ordered emphatically denied that they had been tampered with. His Honour said the only answer made by the defendants was that the contents of the boxes had been changed; but he did not see the slightest reason to disbelieve the plaintiff and his witnesses, who said they had not. He awarded the plaintiff £10 and costs on the "A" scale, and gave judgment for him on the counterclaim.

Amman Valley Gas Company.—In the Chancery Division of the High Court of Justice last Saturday, Mr. Owen Thompson applied to Mr. Justice Warrington, on behalf of Messrs. R. & A. Main, Limited, for judgment, in default of defence, in an action brought by them against the above-named Company. His Lordship gave the ordinary judgment on a debenture holder's action.

MISCELLANEOUS NEWS.

SALFORD CORPORATION BILL.

The Town Council Decide on its Withdrawal.

The General Purposes Committee of the Salford Town Council, which includes the whole of the members of the Council, met on Wednesday morning last to consider what should be done with reference to the Bill now before Parliament.

It was resolved that, in consequence of the alteration made by the Lords Committee of the gas clauses, the Bill be withdrawn; and the Parliamentary Committee were instructed to consider the propriety of promoting another Bill in the next session, to include all the clauses in the present Bill except those relating to the gas undertaking.

At a meeting of the Town Council held immediately afterwards, the decision of the General Purposes Committee was confirmed without discussion.

MANCHESTER CORPORATION GAS DEPARTMENT.

Mr. Nickson's Retirement.

At the Meeting of the Manchester City Council last Wednesday, considerable discussion took place on the proposal of the Gas Committee to appoint Mr. Charles Nickson, whose retirement was noticed in the "JOURNAL" for the 29th ult. (p. 960), Consulting Superintendent of the Gas Department at a salary of £300 a year, and that he be "relieved of the more active duties and responsibilities of Superintendent." Alderman Gibson (the Chairman of the Committee) said the effect of the rearrangement in the Gas Department would be a saving of £250 a year; but this was a small matter in comparison with the moral effect which the passing of the resolution by the Council would have on the whole of the employees of the Corporation. The proposal did not involve any new departure, as similar changes had been allowed in other departments. Mr. Nickson had reached the age of 80 years, 65 of which had been spent in the service of the Corporation. Mr. Gibson concluded by expressing the hope that the Council would put the finishing touch to Mr. Nickson's work by passing the resolution without a dissentient. Mr. Elverston thought the matter should be referred back; and he moved accordingly. He admitted that service under the Corporation should be honourable, and its conditions attractive; but he could not help seeing what a difference there was in the treatment meted out to one class and another. Mr. A. Porter seconded the proposition to refer the matter back—urging that the Council should have a proper system as to retirement at a given age and as to pensions. The proposal of the Gas Committee in this instance seemed to him to be a means of getting round the law of the land, as a man would receive a salary for doing no work. Mr. Barton also did not think it right for the Corporation to get round the law in the way suggested. In the result, the Committee's proposal was approved by 39 votes to 34.

VERTICAL RETORT QUESTION AT LEEDS.

Adoption of the Report of the Deputation to Germany.

At a Meeting of the Leeds City Council last Wednesday, the report of the deputation who recently visited Germany to inspect the systems of vertical retorts in use for the manufacture of gas, as given in the "JOURNAL" last week (p. 30), was presented.

Alderman C. F. TETLEY, the Chairman of the Gas Committee, who brought forward the report, remarked that a great revolution was taking place in the process of carbonizing coal, and their visit to Germany had opened the eyes of the deputation. At Berlin and Cologne they saw immense installations working perfectly, and giving the greatest satisfaction. These vertical retorts were very much like the inclined retorts, except that they were full on end instead of only partially so. The machinery by which they were charged was very similar to that used with inclined retorts; but the coke, instead of being pushed out of the bottom, dropped out easily, and was quickly quenched and carried away. The deputation found a saving of power and of wear and tear, while there was a very large increase in the make of gas, and a great improvement in the quality of coke and other residuals. He moved the adoption of the report, and expressed a hope that the Council would give the Committee permission to go further into the matter, and make experiments as to the efficiency of the system in Leeds by the erection of a setting of forty retorts on the vertical system.

Mr. J. H. STOCKDILL seconded the motion.

Mr. BRASSINGTON opposed the motion because a representative of Messrs. Graham, Morton, and Co. had accompanied the deputation.

Alderman E. MATHESON asked, in view of the rapid growth of the Electricity Department, if this had been considered, and whether there was likely to be a corresponding growth of gas.

Mr. J. S. HINCHLIFFE said the deputation saw the latest and best equipped gas-works in Europe. He defended the visit of a representative of Messrs. Graham, Morton, and Co., saying the firm had (in conjunction with Messrs. Cutler and Sons) the sole licence for the plant at home. Leeds had something to learn, and he asked the Council to allow them to try the experiment.

Mr. H. BROWN said there was no intention of putting anything into the gas-works unless the Committee were satisfied that the system was the best in operation. If there was another vertical system which was English, he would vote for it.

Mr. R. ARMITAGE did not offer to criticize the report, but pointed out that in the works visited the gas was of only 11·5, 12·5, and 12 candle power; so that, he said, the gas made by this system could not be sold

in Leeds under the Corporation's present powers. He wanted to know what the Gas Committee expected to save by the process.

Mr. BADLAY complained of the lack of experts on the deputation, and said no private firm would accept the evidence of the men who accompanied it. He wished the Council to stay their hands—arguing that gas manufacture was yet in an experimental stage.

Mr. O. CONNELLAN, having ascertained that the representative of Messrs. Graham, Morton, and Co. paid his own expenses, said many other firms would have been glad to do the same for a similar opportunity. He wanted to know why the report did not show how much the Corporation would gain through labour being displaced and machinery brought in.

Mr. G. RATCLIFFE said the new process was no experiment at all; it had gone too far. All the great towns in Germany were "scrapping" better plant than they had in Leeds to put in the new system because it had been tested for several years and found satisfactory. No money, he assured the Council, would be spent unless sanction was first asked. One surprising thing was that with gas of lower candle power German towns were better lighted than British ones. His own opinion was that hundreds of pounds were being thrown away in this country because gas of too high illuminating power was made. He was sorry to say that if the new system was introduced it would mean the displacement of some labour; but if gas was cheaper, more people would use it.

Alderman TETLEY, replying on the discussion, denied that the system was in an experimental stage. If the power to experiment were given, the Committee would come to the Council before they spent further money. As to the objection to the visit of a representative of Messrs. Graham, Morton, and Co., they held (with the other firm already named) the sole working licence in England.

The report was adopted.

SALFORD COAL AND ELECTRICITY CONTRACTS.

Prices to be Published before Acceptance by the Council.

By twenty votes to seventeen, the Salford Town Council last Wednesday decided that in future the prices paid for coal and cannel by the Gas and Electricity Committees, and the terms and conditions for supply of current entered into by the Electricity Committee, shall appear on the *agenda* of the Council before acceptance. This is a subject which has been before the Council on many former occasions and has given rise to acrimonious discussions.

At the January meeting of the Council, a Special Committee were appointed to consider and report upon the question whether or not it was advisable that the contract prices should be published on the *agenda*. The Committee, after frequent sittings, failed to agree, and majority and minority reports were issued—the former bearing the signatures of seven members, and the latter of five. The majority report was adverse to the publication of the terms of contracts on the *agenda*, but recommended an amendment of the standing orders entitling members to such information at Council meetings. This report was moved by Alderman Desquesnes, who denied that there were any secret contracts, as had been alleged—pointing out, in support of his contention, that the particulars of contracts were entered on the minutes of Committees, which were open to the inspection of all members of the Council. He added that the public, on payment of a shilling, could inspect the minutes of Committees. He argued that it was not always expedient to publish the information broadcast; and the majority report only recommended the same course as was followed by many other large municipal corporations. The present system enabled Committees to combat "rings" and combinations, as it provided an opportunity for negotiating with firms who had tendered. This power of negotiation had been the means of saving the Corporation £21,000 during the last five years, on coal contracts. As to the electricity contracts, the terms were determined by the time when the current was required, the quantity used, and other considerations. To publish the bare prices in such cases would, he held, be misleading, and might easily cause trouble among those trading with the Corporation under contracts.

The minority report, which was the one adopted by the Council by a majority of three votes, was moved by Dr. Pinder, who, in the course of his remarks, ridiculed Alderman Desquesnes' statement that so many thousands of pounds had been saved on coal contracts under the present system—alleging that firms only put up prices in order to reduce them. With reference to the right of members to inspect the minutes of the various Committees, Dr. Pinder said that members had not the time to wade through big volumes in order to pick out the desired information.

Mr. Wheatcroft, who seconded the adoption of the minority report, pointed out that, under the Municipal Corporations Act, 1882, section 22, it was provided that the acts of every Committee "shall be submitted to the Council for their approval."

Alderman Phillips, Chairman of the Gas Committee, and one of the signatories to the majority report, submitted that if they were going to continue to treat the department of the Gas Committee as a trading concern, they would have, as business men, to maintain their present procedure in the interests of the Corporation.

The advocates of the publication of the prices on the *agenda* were, however, successful, as already stated; and the minority report, when put as the substantive resolution, was adopted without opposition.

Strike of Gas Stokers at Castlebar.—Great inconvenience was recently caused at Castlebar owing to a strike of stokers in the gas-works, resulting in the complete failure of the lighting of the town and the several large institutions. Gas is installed in the premises of all the leading traders; and business had to be suspended owing to want of light. A short time ago the works were acquired by a Company; and the strike is alleged to be due to the action of the Managing-Director in reducing the number of stokers formerly employed.

DEVONPORT GAS UNDERTAKING.

Annual Report.—The Contract with Messrs. Willey and Co.

The Devonport Town Council last Thursday devoted the greater part of their sitting to matters connected with the gas supply of the town. The MAYOR (Mr. J. P. Goldsmith) presided.

The annual statement of accounts of the gas undertaking, prepared by Mr. H. J. Hoare, the Borough Treasurer, was submitted by the Gas Committee. This showed that the make of gas for the year ending March 31 was 355,895,000 cubic feet, as compared with 345,427,000 feet in the previous year. Sales of gas by meter represented 89·7 per cent. of the make, and for public lighting 6·7 per cent.; while 0·9 per cent. was used on the works. The total quantity of gas accounted for was 97·3 per cent., as against 98·1 per cent. There was thus an increase from 1·9 to 2·7 per cent. in the quantity of gas unaccounted for. The consumption increased during the year by 1·6 per cent., and the revenue from sales of gas by 1·8 per cent. (or £805). The gross profit was £18,811, or equal to 6·01 per cent. on the capital of £313,166. The capital now is £912 16s. 2d. per million feet of gas sold, or £9 0s. 4d. per ton of coal carbonized. In the first year of the Corporation's ownership of the works, the capital was £194,475—£725 per million feet of gas sold, or £6 8s. 11d. per ton of coal carbonized. Last year 34,727 tons of coal or its equivalent were carbonized; and the gas made was 10,248 cubic feet per ton. The price of coal was a little over 1s. per ton less than in the previous year. The coke produced was 13½ cwt. per ton of coal carbonized; and the average selling price was 16s. 10·48d. per ton—the highest price recorded during the Corporation's ownership. Tar, on the other hand, fetched only 12s. 9·22d. per ton—the lowest price at which the Corporation have sold it; and sulphate of ammonia, at £7 16s. 10·21d. per ton, was also at a low level. There are now 15,856 consumers—6165 ordinary, and 9691 automatic—an increase of 909 on the year. The number of consumers per mile of main has gone up from 158 to 267 in the past seven years, and 935 stoves had been let on hire during the same period. The net profit, after allowing for interest and redemption of loans, was £1613; and this was transferred to the reserve fund, which amounts to £7586.

Alderman TOZER, the Chairman of the Gas Committee, in moving the adoption of the report, said that of the total sum of £308,427 borrowed for the undertaking, £41,300 represented loans in connection with automatic installations. They had repaid £46,000 of the capital. The gross profit was equal to 7½ per cent. on the present capital. Although they were supplying less gas by 2½ million cubic feet to Government establishments, and the fixing of automatic installations had been stopped, there was an increase this year of nearly 5½ million cubic feet in the quantity of gas sold. A point especially worthy of notice was that the increase per meter on the automatic installations was 2·4 per cent. Though the net profit of £1612 seemed small for so large an outlay of capital, it must not be forgotten that posterity would benefit by what the consumers were now paying. As the installation of automatic supplies was to be resumed, they might expect an increase in the consumption. In the first quarter of the present financial year the wages paid at the works were £129 less than in the corresponding quarter of last year. This saving had been effected in spite of the fact that a good deal of special work was going on. They would ask how it was done. The Engineer found when he took over the duties that the maintenance of the cookers which the Committee had on hire was costing 9s. 9d. each. In the shops in which this particular work was carried on, there were a dozen or twenty men with nothing to do. When he said that in 1908 the revenue from cookers was £406, and the cost of maintenance £391, it would be obvious that something was wrong. In the first year, the cost of the maintenance of cookers was only 11½d.; and then it rose in successive years to 1s. 10½d., 5s. 10d., 8s. 4d., and 9s. 9d. These men who had practically nothing to do were charged to the maintenance of cookers. The Committee hoped that the profit would increase, and that the gas undertaking might be the first of their municipal properties to contribute something to the relief of the rates.

Alderman HORNBROOK, the late Chairman of the Gas Committee, was quite in sympathy with Alderman Tozer in all he had said. He supposed every succeeding Engineer would find out some imperfection in his predecessor's work, and try to improve upon it. Mr. Tozer's last remark had been a revelation. The Committee did not know anything about it. It was simply a piece of "jiggery-pokery work," known only to those engaged in it. The figures which had been given showed that the gas undertaking was the best asset the town had, or in all probability ever would have.

Mr. BISHOP said the report showed that some men had laboured, and others had entered into their labours. Mr. Buckley, the late Engineer, took charge of the works at a very critical time, and had a big job, which he successfully performed. During his office, things were done out of revenue that ought to have been charged to capital; and if this had been done, the returns would have appeared better. As to the cost of the maintenance of the stoves, no man was on the works doing nothing when Mr. Buckley was there; and if these men were paid their wages, they were no doubt earning them.

Alderman TOZER remarked that all he could take was the statement of the Engineer (Mr. W. P. Tervet) as to what he found, and what they found now—more work at less cost.

Mr. BISHOP had no doubt that the men were doing other work, though they were charged to this particular account.

Alderman LITTLETON challenged the statement of Mr. Bishop that work had been done out of revenue which could be charged to capital, and said that in regard to retorts this was clearly not the case, because they were simply a renewal, and could not be charged to capital. It was a debatable question whether they should reduce the price of gas or whether profits should go towards lowering the rates; but he hoped the working classes would be first considered.

Alderman FREDMAN suggested that the reserve fund was too large, and that the time had arrived when the price should be reduced or some of the profit transferred to the rates.

Mr. ELLIS, however, pointed out that the only payment for insurance

against fire was 30s., which covered the offices at the works. Unless, therefore, they had a substantial reserve fund, they were in danger of being overtaken by disaster. In his opinion, they should have a fire insurance fund in addition to the reserve fund.

Alderman TOZER said the matter would be considered by the Committee. In the past, the works had not been insured because of the heavy premium.

The report was then adopted.

The Special Committee appointed last year to investigate the question of the agreement with Messrs. Willey and Co., Limited, with reference to automatic installations, and to enter into negotiations with the firm, next presented their report. They stated that, as the outcome of friendly negotiations, Messrs. Willey had met them in a reasonable manner, and terms had been arranged which the Committee unanimously recommended the Council to approve. The Contractors agreed that the prices for automatic installations for the remainder of the period of the agreement—namely, until July 26, 1913—should be the market prices, instead of those stated in the agreement. This involves the following changes:—

Installations.	Under the Existing Agreement.		Current Market Prices.
3 points	£3 15 0	..	£3 1 0
3 points and boiling ring	3 18 0	..	3 3 3
3 points and griller	4 4 0	..	3 6 2
3 points and cooker	4 18 0	..	4 7 2

with a limit of 500 feet of compo pipe.

This alteration in prices will involve the following alterations in the amounts to be paid by the Contractors in case the installations are removed:—

	Old Agreement.		New Agreement.
Meter	£2 2 6	..	£1 12 6
Griller	9 0	..	3 6
Cooking stove	1 3 0	..	14 6
Boiling ring	3 0	..	1 0

In respect of all installations fixed after July 26, 1908, the Contractors will forego their right under the agreement to maintain them, and the Corporation will undertake the maintenance at their own expense. The Contractors will continue to maintain the installations fixed prior to July 26, 1908, and will be paid 4s. 8d. per annum in respect of each installation. The Corporation in return for these concessions agree (*a*) that the Contractors shall at once be entitled to supply installations and the Corporation shall not unreasonably withhold or disapprove applications for installations which may be submitted, and (*b*) that, until the expiration of the agreement, the Corporation shall place all orders for cookers, fires, grillers, ring-burners, sundries, ordinary meters, automatic meters, and main-cocks, with the Contractors, at the market prices of the day. In case of dispute as to what is the market price, the question will be determined by the President of the Institution of Gas Engineers, or such other person or persons as may be agreed to by the parties. The Committee unanimously recommended the Council to accept these terms. They stated that they had given instructions to the Gas Engineer to hold over for the present new applications for automatic installations. These instructions have been withdrawn, and installations are now being supplied. The Special Committee also reported with regard to questions which had arisen respecting contracts with Messrs. Willey for the supply of ordinary dry meters, automatic meters outside the contract of Aug. 3, 1903, and main-cocks. A contract had been made for the supply of these goods for one year ending March 31, 1904, and was extended by the Gas Committee, with the approval of the Council, until March 31, 1906. The Special Committee were asked to determine whether it had been further extended by order of the late Chairman of the Gas Committee, as had been stated in certain correspondence between the late Gas Engineer and Messrs. Willey. The Committee had investigated the matter, and were satisfied that the contracts had not been so extended; and Messrs. Willey have expressed their concurrence in this view. None of these contracts are at present in force.

A lengthy discussion on the report took place; and at its close,

Alderman LITTLETON said that under the new arrangement the town would save something like £6000, and Messrs. Willey got nothing in return except the current market price for the goods they were to supply. On these terms, the Contractors gave them really £6000.

The MAYOR remarked that the Town Clerk had worked exceedingly hard and well in this matter.

The report was then adopted.

LONGTON GAS AND ELECTRICITY SUPPLY.

The Past Year's Working.

In the last number of the "JOURNAL" (p. 59), we reported the remarks of the Vice-Chairman of the Gas and Electricity Committee of the Longton Corporation (Mr. W. Hulse, J.P.) on the past year's working of these departments of the Corporation. We are now able to give some additional particulars from the Committee's report and the statement of accounts.

The Committee report that the total quantity of gas made during the year was 151,141,000 cubic feet; being a decrease on the previous year of 3,309,000 cubic feet, or 2·2 per cent. The gas sold shows a drop of 2,311,000 cubic feet, or 1·6 per cent., due to depression in trade and the mild weather during the winter months. The quantity of gas unaccounted for was 4·01 per cent.; being the lowest leakage account recorded in the history of the undertaking. The Committee express regret that during the year the market values of all residuals were adversely affected, in sympathy with the general depression in trade. Compared with the preceding twelve months, the income from tar, sulphate of ammonia, and coke diminished by £775. On the other hand, there was a substantial increase in the quantity of gas produced per ton of coal carbonized, and, as already remarked, the unaccounted-for gas showed a considerable improvement. These two factors are largely responsible for the satisfactory profits on the year's working. The price charged for gas was reduced during the year by 5d. per 1000 cubic feet. The amount paid over to the borough fund in relief of the rates was £3000; the total so employed since the purchase of the gas-works by the Corporation having been £68,397. The gross profits on the year's working amounted to £10,145. After providing for interest and sinking fund charges on capital, there remained a net profit of £4508, which has been dealt with as follows: Paid over to the borough fund, £3000; expended on fitting up cottages on the slot system, £187; expended on new mains, £378; do. on new meters, £555—total, £4120, and leaving a balance of £388 to be carried forward.

With regard to the supply of electricity, the Committee report that the total number of units generated during the past year was 273,401; being an increase of 71,817 units, or 35·6 per cent. The total number sold and used on the works was 248,428. All new meters, repairs, and renewals of machinery and plant were paid for out of revenue. The Committee remark that the increase in the quantity of current used both for lighting and motive power purposes shows that electricity is making rapid headway. Additional generating plant has to be added before the coming winter; and there must also be an enlargement of the station. The cost of these extensions will be met out of the depreciation and reserve fund. The average price paid per unit for motive power was 1·7d.; for lighting, 4·8d. The gross profits for the year amount to £1633, and the interest and sinking fund charges amounted to £1532; leaving a net profit of £101.

Following the report are the accounts. The first table shows the quantity of gas made, sold, and unaccounted for from 1879 till the past financial year. In 1879, the make was 65 million cubic feet, of which 56½ millions were sold, and the leakage was 13·28 per cent. Last year, the figures were 151 and 145 millions, and a loss of only 4·01 per cent. At the outset of the Corporation's management, the price of gas was 3s. 6d. within the borough; but it was lowered to 3s. in 1885. It had to be put up again in 1901; but it was quickly brought down 3d., then another 2d., and is now 2s. 9d., less 3d. discount. From 1898 till the last financial year the price was subject to 5 per cent. discount; so that in the ten years there has been a reduction, notwithstanding that the price of coal has increased 20 per cent. The next table shows the amounts paid to the borough fund since the gas-works were transferred to the Corporation. They range from £500 (in 1899) up to about £4000 (in 1883); but it appears that these amounts could really not be afforded, and the undertaking was consequently handicapped with a high capital account. Since the present Engineer and General Manager (Mr. W. Langford) took office, £2000 was transferred to the borough fund annually for six years, £2500 for three years, and now £3000; and no addition has been made to capital account by way of loan. This account has, however, received contributions to the extent of £24,723 from revenue. The total outlay stands at £151,173, of which £77,173 has been spent on new works; but in March, 1905, a sum of £1450 (not shown in the account) was written off for depreciation. The £80,000 originally borrowed in respect of the gas undertaking, as well as £20,000 subsequently raised, will both be repaid in nineteen years; while a further loan of £10,000, repayable in thirty years from June 30, 1894, will be cleared off in fifteen years. The capital actually employed is: Mortgage loans, stock, and debentures, £132,450; less repaid and in sinking fund, £41,733—total, £90,717. As mentioned in the Committee's report, the gross profit is £10,145; being the difference between the revenue, £25,255, and the expenditure, £15,110. The revenue account contains on the expenditure side two items of exceptional interest. Only £39 was spent for purifying materials and labour; and the bad debts are put down at the low figure of £7 17s. 8d. The depreciation and reserve account stands at £4150—viz., £2086 for the gas and £2064 for the electricity undertaking.

The following are the general results of the year's working: Coal gas made, 141,715,000 cubic feet; water gas made, 9,426,000 cubic feet—total, 151,141,000 cubic feet. Gas sold to private consumers, 124,300,400 cubic feet; for public lighting, 19,078,000 cubic feet; used on works, 1,699,000 cubic feet; unaccounted for, 6,063,600 cubic feet. The quantity of coal carbonized was 11,330 tons; and the make of gas was 12,507 cubic feet per ton. The production of residuals was: Coke, 7364 tons; tar, 742 tons 5 cwt.; sulphate of ammonia, 135 tons 10 cwt. They realized respectively 5s. 10·6d., 1s. 2·3d., and 1s. 8d. per ton of coal used.

DARLINGTON GAS UNDERTAKING.

The Accounts for the Past Year.

The accounts of the Gas Department of the Darlington Corporation for the year ended March 31, a copy of which has reached us from the Engineer and Manager (Mr. Frank P. Tarratt), show that the sale of 351,420,479 cubic feet of gas produced £36,984; that residuals brought in £14,252; and that the total revenue was £53,615. The expenditure on the manufacture of gas was £22,842; on purification, &c., £1020; wages came to £3908; repairs cost £4125; distribution, £4528; rates and taxes, £2257; management, £1465; and sundry items brought up the total to £41,170. The balance carried to the profit and loss account was £12,445; and with the amount brought forward there was produced a total of £18,873. This has been disposed of as follows: Liquidation of loans, £4111; interest on loans, £3010; transferred to district fund in aid of rates, £4500; transferred to reserve account, £1929; net profit carried forward, £5323. The working statement shows that this sum is equal to 2s. 9·005d. per ton of coal carbonized, 3·352d. per 1000 cubic feet of gas made, and 3·636d. per 1000 cubic feet sold. The quantity of coal carbonized was 38,710 tons; and the make of gas 381,234,000 cubic feet, or 9848 cubic feet per ton. The residuals produced were: Coke and breeze, 19,554 tons 18 cwt.; tar, 386,044 gallons; ammoniacal liquor, 1,058,629 gallons—yielding respectively 11s., 15s., and 8s. 6½d. per ton. The capital invested in works and plant amounts to £185,976; being at the rate of £4 16s. 1d. per ton of coal carbonized, and 10s. 7d. per 1000 cubic feet of gas sold. The gross profit is 6·69 per cent. upon the total capital employed.

INCREASED SALE OF GAS AT HEREFORD.

Engineer's Annual Report.

In his third annual report on the accounts of the Gas Department, which was submitted at last Tuesday's meeting of the Hereford Town Council, the Gas Engineer (Mr. W. W. Townsend) says there was an increase in the quantity of gas sold during the year, amounting to nearly 4½ million cubic feet. Considering that even now consumers are economizing by the more extended use of incandescent burners, and that the inverted burner—with its higher efficiency—is coming more into use every day, and also taking into account the competition that has to be met, these figures are, he thinks, very gratifying, and show that the cheapness of gas and the various facilities offered by the Committee to encourage its use are fully appreciated. An important fact is that the increase was not confined to one quarter of the year, or to one section of the business. The number of consumers continues to increase, and also the number of cooking and heating stoves on hire. A large number of outside shop lamps were fixed during the year. The gross profit for the twelve months was £4388, against £4381 for the previous year. The gas-rental was £290 more, and the net receipts from automatic meters £265 more. Residual products realized £5205, against £4993. The value of fitting work done for consumers and fittings sold was £1940; and the profit was £25 less than the previous year. The income from the hire of stoves was £428, against £402; but £419, against £352, was spent on repairs. Coal cost nearly the same—£9941, against £9920. About the same quantity was used, though 4½ million feet more gas was sold. A reduction in price averaging about 8d. per ton was obtained last June; but the saving thus effected was offset by the higher price paid between March and July as compared with the previous year, when some of the old contracts were running. Maintenance of works cost £2170, against £1657. Several exceptional repairs and improvements were effected, in order to bring the works to the highest state of efficiency. Gas-making wages were £1610, against £1543, because of the extra gas made. The amount of gas made per ton of coal was 10,981 cubic feet, against 10,560 cubic feet. If corrected to normal temperature and pressure, as is the general practice, the figure is increased to 11,254 cubic feet per ton of coal. No enrichment was used. Unaccounted-for gas is about the same as last year—6·8 per cent., against 7·1. A sum of £1093 was expended during the year on new street-lamps and the paving of the coke-yard. New prepayment installations cost during the year £202.

The quantity of gas made was 135,243,000 cubic feet; the coal carbonized amounting to 12,314 tons. The gas sold showed an increase of 3·6 per cent. The revenue from the sale of gas and meter-rents was 2s. 8·4d. per 1000 cubic feet of gas sold; while the cost price of gas, after deducting receipts from residuals and profit on fittings and stoves, was 2s. per 1000 feet. The net profit per 1000 cubic feet, after deducting interest and sinking fund, was 3·5d. The cost price of gas in the holder, not including rates and taxes, distribution expenses, &c., was as 1s. 4d. per 1000 cubic feet made.

Mr. Witts, in moving the adoption of the report, pointed out that the increased sale of 4½ million cubic feet came on top of 3 millions increase the previous year. The Council would be glad to hear the Committee again recommended that £1000 should be granted to the improvement fund. The profits of the undertaking had been maintained, notwithstanding a reduction in the price of gas. He congratulated Mr. Townsend on the results he had attained.

After some discussion, the report was adopted.

LEEK URBAN COUNCIL GAS DEPARTMENT.

Report of the Engineer.

In the course of his second annual report to the Leek Gas Committee, covering the financial year to March 31 last, Mr. S. Trow Smith, the Engineer and Manager, says the capital account of the undertaking stands at £26,495. During the year £2505 has been expended on capital account on the following work: Station-meter, £700; capstan and retort-house extension, £169; Rudyard extension, £1355; new meters, £177; and new mains, £104. The capital expenditure per ton of coal carbonized is £2 8s. 8d., or 4s. 7d. per 1000 cubic feet of gas made.

There has been an increase in the amount of gas sold of 1,651,000 cubic feet, or 1·81 per cent., and an increase in the income from the sales of £914. Ordinary meters show a decrease in gas consumption of 91,500 cubic feet, and prepayment meters an increase of 1,742,500 feet; the decreased consumption no doubt being due to the serious depression of trade during the latter part of the year. The increased income from ordinary meters was £638, and prepayment meters £291; an increase in the price of gas through ordinary meters operated for the full year. The number of meters in use at the end of the year was 2035 ordinary and 1913 slots; being a decrease of 5 ordinary meters and an increase of 86 slots. The number of consumers was 1562 ordinary and 1912 slots—a total decrease of 24 consumers.

The total income from residual products was £4096; a decrease of £558 on the previous year. Coke realized £2354, or an increase of £180, higher prices having been obtained. Tar realized £431, or a decrease of £351—due to reduction of stock and to the serious drop in the price received, the market being almost stagnant. The total income from all sources amounts to £16,275, as compared with £15,561, an increase of £714. The total expenditure on the year's trading amounts to £12,489, or a decrease of £25 0s. 5d. The cost of manufacture has absorbed £9691, being equal to 17s. 9·567d. per ton of coal carbonized, as compared with 18s. 8·163d. the previous year.

The quantity of coal carbonized during the year was 10,891 tons, or 217 tons more than last year; the gas produced being 115,639,000 cubic feet, or 10,617 feet per ton, against 10,486 feet per ton last year—or an increase of 131 feet. This is the highest make the Gas Department has had.

The gross profit amounts to £3735, an increase of £739 over last year, and equal to 14·28 per cent. on the capital of the undertaking, against 11·89 per cent. last year. This is excluding estimated receipts from public lighting. Interest, sinking fund, and capital repaid absorb £2551, leaving a net profit on the year's working of £1234, compared with £736 last year—an increase of £498. The bank overdraft last year stood at £1516; and with the profit made this year *plus* adjustment of stock, it is reduced by £1420 to £96. So that the current year will see it entirely wiped out and a balance in hand.

During the year alterations have been carried out on the works, including the removal of the governors; an 18-inch main having been laid for the better supply of the town, with a consequence that working pressures have been reduced nearly 1 inch, with an improved supply. The leakage account is slightly higher this year; being 10·13 per cent., against 9·68 per cent. last year. The increase is, Mr. Smith says, most probably due to correct registration by the new station-meter.

The accounts are, it may be remarked, still subject to the Local Government Board audit.

PRICE OF GAS AT TEIGNMOUTH.

Considerable discussion took place at the meeting of the Teignmouth District Council last Tuesday with reference to a proposal of the Gas Committee to reduce the price of gas from 3s. 6d. to 3s. 3d. per 1000 cubic feet. The question had been considered at the previous meeting of the Council, and was then, as recorded in the "JOURNAL" for the 8th ult. (p. 661), referred back to the Committee.

The Gas Manager (Mr. J. A. Gray) now presented a report, in the course of which he pointed out that the assumption that gas profits can only be maintained by keeping up the price of gas is not borne out by the Council's own experience of the past eight years. The repeated reductions in price have invariably resulted in increased gas consumption and levelled-up the financial position. He submitted figures giving the gross profits and prices charged for gas over a period of seven years; and they showed that in the year 1903 the profit was £1566 with the price of 4s. 2d., while in the past financial year it was £2247 with the price at 3s. 6d., or 8d. per 1000 cubic feet less. Thus, with gas at the lowest rate, the gross profit was the highest recorded; and he (Mr. Gray) did not hesitate to express the opinion that the financial position of the Gas Department would be very much worse to-day if the gas prices of the past still prevailed. He went on to say: "So long as there are non-gas consumers in the area of supply, there are good business reasons for price reductions; and it must not be forgotten that the question of low price becomes much more important in relation to the uses of gas for cooking, heating, and motive power, for which purposes there is still a large field to exploit. The 'JOURNAL OF GAS LIGHTING' for June 8, in a leader on 'The Latest Municipal Results,' states that at Teignmouth 'repeated reductions in the price of gas have not diminished the profit-producing powers of the department, but, on the contrary, have, as one would expect, exercised a beneficial effect.' Surely, therefore, it will be time enough to cease from the practice of price reductions when it is found that the financial position is being adversely affected thereby." As to disposal of profits, Mr. Gray said: "I have previously pointed out that the actual cash at present available is not a large amount. It was stated at the last Council meeting that any surplus profit should be used in the maintenance of plant before thinking of reducing the price of gas. I have endeavoured to indicate that reductions in the price of gas do not necessarily mean reduced profits. That surplus gas profits, however, should be used to maintain the gas plant before being devoted to any other purpose surely admits of but one opinion; and the creation of a fund to obviate the necessity of taking up any further loans for gas purposes, and to defray the cost of all extraordinary gas departmental expenditures, is a matter which merits your serious consideration. Such a fund would tend to the gradual total extinction of the capital debt on the gas-works—thus allowing for the production and sale of gas being conducted on the most economical lines, and to the best advantage of the gas-consuming ratepayers, from whom the revenue is derived. Under these conditions, in all probability there would soon be very few non-gas consuming ratepayers; and the individual advantage would be proportionate to the gas consumption—the Gas Department being of the greatest service to those most valuable to itself. So long as the consumption is maintained, the responsibility for the gas-works of the ratepayers in that capacity is quite negligible. I beg to advise you, therefore, that a policy of gas price reduction is calculated to increase the gas consumption, and does not necessarily mean reduced profits. I suggest that, in the interest of the department, consumers should be your first and final consideration. They 'pay the piper,' and are entitled to 'call the tune.'"

Mr. F. C. Francis moved that the matter be again referred to the Gas Committee, and said he understood the Council were going to revert to the system of having every member on the Committee. The question could then be considered by all of them. Mr. S. Slocombe said this meant that the reduction would in any case be deferred for two months. Mr. Alsop remarked that the consumers had had a great deal of attention during the last ten years, and they had deserved it; but there came a point when the general community should be considered. The price of gas at Teignmouth did not compare unfavourably with surrounding districts. He was of opinion that if there was a balance which would justify a reduction, it should be applied in relief of the rates. Mr. Furler was also of this opinion. It was decided by seven votes to five to refer the matter back to the Committee.

Incandescent Gas Lighting at West Bridgford.—At the monthly meeting of the West Bridgford Urban District Council held last week, attention was called to the report of the Surveyor on the public lighting, which was considered very satisfactory. The gas account before the incandescent system was adopted was £506 for 240 lamps, which averaged £2 2s. 2d. per lamp. There are now 300 lamps, which at the same rate equal £630; whereas the actual gas account last year under the incandescent system was £375, or a saving of £255.

IMPROVEMENTS AT THE HAVERHILL GAS-WORKS.

Local Government Board Inquiry.

At the Town Hall, Haverhill, last Tuesday, Major J. Stewart, R.E., conducted an inquiry in regard to an application made to the Local Government Board by the Urban District Council for sanction to borrow £1000 for extensions and improvements at the gas-works. Among those present were Mr. J. B. Coster (the Chairman of the Gas Committee), Mr. George Winstanley (representing Messrs. Winstanley and Co., the Contractors for the retort-benches), and Mr. G. F. Cutting (the Gas Manager).

In answer to inquiries, the Inspector was informed that the outstanding loans on the gas-works amounted to £3439. The works were erected in 1850, and purchased by the Council in 1886. The population of the town was increasing; and, notwithstanding the bad trade which had prevailed, the works had been going at their full capacity during the past two winters. The actual cost of the proposed work was £1575, of which £575 would be paid out of revenue. They required the loan to extend over a period of twenty years. The Inspector remarked that previously the Council had asked for loans for as long a period as possible; and he wished to know why they now asked for only twenty years. The Clerk (Mr. T. Bates) said they wanted to get it paid off as soon as possible. The Inspector said he did not think the Board would argue as to that; for it was not often they found such sound finance with small public authorities. It was further stated that the present demand for gas was for 40,000 to 90,000 cubic feet per day, and there was a yearly increasing demand. The average day's make was from 40,000 to 80,000 cubic feet—the latter figure being the maximum. It was for this reason—because they could not carbonize sufficient coal to meet the maximum day's demand—they were making the application. Messrs. Winstanley and Co. had contracted for £878 and £97. The first-named sum was for retorts, chimney, and benches; and the £97 was for ironwork in the roof of the retort-house. Three benches of retorts were to be erected, each to take three retorts, and two would be used—the other being kept as a stand-by. At the close of the inquiry, the Inspector visited the works.

WORKINGTON GAS UNDERTAKING.

The Past Year's Working.

The Gas Engineer and Manager of the Workington Corporation (Mr. George Keyte) has presented to the Gas Committee his report on the working of the gas undertaking in the year ended the 31st of March. He says it is exceedingly gratifying that the distressful period through which the town passed did not leave any mark on the finances of the Gas Department. The results of the year's work may be summarized thus: The falling off to the extent of £332 in the amount of the gross profit, compared with that of the previous year, is more than accounted for by the reduction of 2d. per 1000 cubic feet in the price charged for gas since Sept. 30, representing £433; and this also accounts for the difference of £477 in the net profit. There was a decrease of 1,186,000 cubic feet in the quantity of gas sold, representing a loss of £134 in revenue. Manufacturing charges, including coal, purification, and repairs of retorts, buildings, and plant, amounted to £9265, compared with £9790—a reduction of £525. Distribution charges, excluding public lighting costs, amounted to £624, against £802 last year—a difference of £178. The total expenditure was £12,737, compared with £13,460 before; the income totalled £16,192, against £17,248. The number of ordinary meters in use decreased by 33, from 1969 to 1936. On the other hand, the prepayment meters increased from 1964 to 2010; making 46 additional. There was thus a net increase of 13 meters. An event of the year was the introduction of a special price for gas-engine supplies; this being 2s. per 1000 cubic feet from Dec. 31. The quantity of gas produced per ton of coal carbonized increased from 10,755 to 11,100 cubic feet. For the first time in the history of the undertaking, the sale of gas exceeded 10,000 cubic feet per ton; having risen from 9990 cubic feet in 1907-8 to 10,580 cubic feet last year. The unaccounted-for gas decreased from 5·86 to 3·63 per cent.

Appended to the report is a working statement which furnishes the following particulars: Gas made, 100,051,000 cubic feet; gas sold, ordinary meters, 59,774,600 cubic feet; do., prepayment meters, 25,063,500 cubic feet; gas used by public lamps, 10,529,000 cubic feet; used at works and offices, 1,048,100 cubic feet; total accounted for, 96,418,200 cubic feet; unaccounted for, 3,632,800 cubic feet; coal and cannel carbonized, 9013 tons; average quantity of gas made per ton, 11,100 cubic feet; coke available for sale per ton of coal and cannel carbonized, 8·72 cwt.; tar made, 12·68 gallons; sulphate of ammonia made, 25·51 lbs.

Mr. Hall, the Chairman of the Gas Committee, in moving the adoption of the Manager's report, at the monthly meeting of the Town Council, said the prepayment meters had increased from 1964 to 2010, and now outnumbered the ordinary meters. They took the first place in the distribution of gas; and the amount collected through them was no less a sum than £3459. The price of gas had been reduced to 2s. 4d. per 1000 cubic feet. They had never had gas at a lower price, though the cost of coal was 1s. per ton higher when the price was last 2s. 4d. The Committee had decided to adopt the suggestion of the Borough Treasurer (Mr. J. Noble) that the suspense account of £3137 should be wiped off. This would mean that they would save £295 per annum. They had in their gas-works a wonderful asset. The property was more than sufficient to pay their liabilities twice over, if it were valued to the fullest extent. Nothing had been starved to produce this result. They had better plant and were better equipped than ever they had been. The Council must feel that their thanks were due to the splendid management of Mr. Keyte, his staff, and his workmen.

The report was adopted.

THE EXPLOSION IN GRANGE ROAD, BERMONDSEY.

A Borough Councillor Seeks Information.

At the Meeting of the Bermondsey Borough Council last Tuesday, Mr. J. W. Oake said he had written a letter to the Town Clerk (Mr. F. Ryall) informing him of his intention to ask a number of questions referring to the fatal explosion in Grange Road, Bermondsey, in December last. The Mayor (Mr. H. F. Morriss) said he had had an opportunity of reading Mr. Oake's letter, and he did not think it was in the interests of the ratepayers that the Town Clerk should reply to the questions, as the matter was *sub judice*. Mr. Oake said the questions affected tradesmen in Grange Road, who for some months had been deprived of obtaining their living. He was trying to study the best interests of the ratepayers. The information he required was public property, and could be obtained by a ratepayer at any time. The Mayor said it was part of the Council's case now before the Court. He could not allow Mr. Oake to read his letter, but he could ask questions, though he (the Mayor) did not think the Town Clerk would answer them. Mr. Oake said in these circumstances he should hand a copy of his letter to the reporters.

In the course of his letter, Mr. Oake asked whether it was not a fact that at the end of 1896 and during 1897, the Town Clerk, as the Vestry Clerk, and Mr. Sumner, as the Engineer, repeatedly corresponded with the London County Council as to the danger likely to arise in consequence of the methods proposed to be employed by the Council in connection with the diversion of the Grange Road sewer; and whether the Council finally declined to recognize any danger as likely to arise from the methods proposed and employed. He requested the Town Clerk to lay before the Borough Council a copy of all the correspondence on the subject between himself and any other officer of the late Bermondsey Vestry and the London County Council, and asked him whether he did not consider that the production of the correspondence at the right time and place was not calculated to relieve the Bermondsey Council from any liability in connection with the explosion.

Mr. Oake proceeded to ask the Town Clerk whether it was not a fact that on Jan. 25, 1897, the General Purposes Committee of the Vestry reported that the London County Council were not diverting the branch drain and sewer connection of the high-level sewer in Grange Road, and moving it into the lower-level sewer. He said the Surveyor (Mr. Sumner), who had since left Bermondsey, reported that he had made an inspection of these connections, and found two of them were not so perfect as he would wish. The Committee recommended that the London County Council should be requested to reconstruct such connection, or that they should be informed that the Vestry would hold them responsible in the event of any blocking at any future date. The Committee also reported that they were informed that the County Council did not intend filling up the disused culvert. The Committee thought it was most desirable that such culvert should be filled up; and they recommended that a request should be made to the Council urging upon them the necessity for so doing. Mr. Oake further asked whether on May 24, 1897, the Committee did not report to the Vestry the receipt of a letter from the County Council to the effect that the question of filling up the old sewer in Grange Road had again been considered by the Main Drainage Committee, but that as the sewer was at a much lower level than the gas-main and the service-pipes, and the sewer grates had not been removed or closed, they were advised that no danger was likely to arise. Under the circumstances, the Committee did not see their way to do other than adhere to their former decision not to fill up the old sewer. Finally, Mr. Oake asked the Town Clerk whether, in view of the fact that the County Council had denied all liability for the explosion, and that a deputation of tradesmen had waited upon the Borough Council, complaining of the undue delay in repairing the road, the objections about the non-removal of the old sewer had been conveyed to the County Council since the explosion. The Town Clerk declined to answer any of the questions. Mr. Oake said he was very sorry for the ratepayers, more especially those in Grange Road who had been inconvenienced by the explosion, that the minutes of the late Vestry had not been searched before, as it might have assisted in having the road repaired long ago.

MUNICIPALITIES AND GAS-FITTINGS.

[From the "Ironmonger," July 10.]

Manufacturers of gas-fittings and similar appliances who have hitherto encouraged the gas departments of municipal corporations to establish a sort of monopoly in the sale and installation of such goods, are now beginning to find that their pet customers, fondly imagining that they have the manufacturers in the hollow of their hands, are beating them down to the lowest farthing in price. That, perhaps, is merely business; but the gas managers go rather further, and insist upon a standard of quality that is only rarely attainable. They specify, for instance, that all machine parts of gas-fittings shall be gauged to the 2000th part of an inch. It is possible, of course, to attain this degree of accuracy with a machine tool, and for very fine engineering work it is often done; but no machinist would undertake to do it except for work of a very special kind. An extremely fine adjustment of the micrometer gauge is required to register such a minute discrepancy. When working within such limits, the machinist has to gauge his work and change his tools at very frequent intervals, for the simple reason that the presence of a grain of sand in a casting will impair the accuracy of a tool and produce a discrepancy in the work far beyond that allowed by the specification. To apply the micrometer gauge to gas-fittings in this way means an additional outlay for supervision and for tools, and an enormous increase in the amount of wastage. A manufacturer recently had £100 worth of fittings rejected by a municipality because they failed to pass the measurement test set out in the specification. How many the manufacturer had already rejected of his own accord, before dispatching the goods, must be conjectured. Apart from

this slight discrepancy, the fittings were probably perfectly sound and workmanlike. Several of the leading manufacturers have appealed to the gas managers to mitigate the severity of the test; but their protests have availed them nothing. With a lordly contempt for the practical difficulties that have been mentioned, the gas managers say that it is quite feasible to work within the limit specified, and that if the manufacturers refuse to do it, the municipalities will put down plant and do the work themselves. And, of course, there is nothing to prevent their doing so. With the huge profits accruing from the gas monopoly behind them, and with no obligation laid on them to produce a reasonable return on the capital invested, they will be able to make their own gas-fittings and make them to the 10,000th part of an inch if they please. In those days, perhaps, the manufacturers of gas-fittings will sympathize more fully than they do at present with the private gas-fitters whose trade has been swallowed up by the competing municipality.

COVENTRY WATER SUPPLY.

A Successful Year.

Another successful year has to be recorded for the Water Department of the Coventry Corporation. The receipts from water-rents have amounted to £20,015, as compared with £19,409 for the previous year. This figure is the highest in the history of the undertaking. Other receipts amounted to £561, making a total of £20,576. The working expenditure was £12,100, against £8154. The balance of revenue over working expenses is £8476, to which must be added the interest £55, making a total of £8531. The capital charges are £6397; leaving a net profit of £2134, as against £6405. It should be pointed out that the profit would have been greater but for certain exceptional items of expenditure, amounting to £1757, in addition to an item of £440, included in rates and taxes, being income-tax for the year 1907-8, not collected until after March 31, thus bringing two years' payment of tax into the past year. The increased capital charges due to borrowing on account of the Shustoke scheme, and for extension of mains, amount to £1184. The cash balance on March 31 last was £6518, of which £2250 (the second moiety of £4500 appropriated by the Council in June, 1908) is due to the borough fund, leaving a disposable balance of £4268. It is proposed to appropriate this as follows: £538, the first of five instalments of the costs of the Act of 1907, to be repaid to the capital fund; £3000 to be paid over to the borough fund in aid of the next two borough rates, in equal portions; and the balance of £730 to be carried to the next account.

The Water Engineer (Mr. J. E. Swindlehurst) states that during the past year a constant supply has been maintained throughout the area. In regard to the Shustoke supply, the works, comprising the laying of a length of 11⅝ miles of cast-iron pipes 20 and 16 inches in diameter, for the conveyance of the water from the Shustoke reservoirs of the Birmingham Corporation to Coventry, were commenced on Oct. 10, 1907, and completed on Sept. 3, 1908. Up to the present time, it has not been found necessary to take more than the minimum quantity from Shustoke—viz., about 822,000 gallons per day. It is noted that, as indicating the quality of this work, the whole scheme has so far proved extremely satisfactory in working.

During the twelve months new mains to the length of 3·38 miles have been laid. At the close of March last, 21,906 houses and shops were connected to the water-mains, an increase during the year of 1499 houses, or 7·3 per cent. At the same date, 418 meters for trade supplies were connected. Altogether the result of the year's operations is regarded with the greatest satisfaction.

NEW RESERVOIR FOR CARDIFF.

Contract v. Direct Labour.

At a recent Meeting of the Water Committee of the Cardiff Corporation, the question was raised as to whether the construction of the new Llwynon reservoir in the Beacons should be carried out by the Corporation directly or by contract. Alderman R. Hughes moved that they recommend the Council to carry out the work by direct labour, being of opinion, having regard to past experience, that by so doing a considerable saving would be effected, and the work would be more rapidly and effectively proceeded with. Mr. G. A. Seccombe seconded the motion. Alderman Beavan, in supporting it, said the new reservoir would hold four times the quantity of any existing reservoir, and the cost would be a long way short of four times greater. Alderman Illtyd Thomas favoured the work being done by contract. He said the reservoirs constructed at Swansea and other places by direct labour had cost about twice the amount of the estimates. If the work was done by contract, it would be supervised by their own Engineer; and this, he submitted, was a greater guarantee of safety than if Mr. Priestley did it unsupervised. He moved, as an amendment, that they invite tenders, and that Mr. Priestley tender in competition. Mr. James Robinson seconded the amendment. Mr. Seccombe said their previous experience was that contract work had been a failure. The contract for Cantref was £82,000, and the actual cost £160,000. In the construction of reservoirs there were inevitably many extras; and contractors charged very heavily for these. Mr. Reginald Harrison advocated contract work. He elicited that Mr. Priestley's estimate of Llwynon was £272,000. The resolution was carried; and it was further decided that Mr. Priestley should supervise, and be responsible for, the work, and be paid £400 per annum in addition to his salary of £600 till the reservoir is completed.

Pontefract Gas Undertaking.—At the meeting of the Pontefract Town Council last Wednesday, a statement was presented showing a deficiency of £787 on the gas undertaking for the past half year. The works were purchased by the Corporation about two years ago; and it was stated that they are now in a dilapidated condition. Further particulars are to be furnished to the members.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 92.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17¾—18¼	+¼	5 9 7
298,955	10	,,	7	Do. 7 p.c.	12½—13	..	5 7 8
310.000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd.	5½—5¾	..	5 12 7
40,000	5	,,	6½	Do. New, £4 paid	4¼—4½	+⅛	5 13 6
50,000	10	Feb. 25	14	Bournemouth Gas and Water 10 p.c.	28¾—29¼	..	4 15 9
51.810	10	,,	7	Do. B 7 p.c.	16¾—17	..	4 2 4
53,200	10	,,	6	Do. Pref. 6 p.c.	15⅝—15⅞	..	3 15 7
380,000	Stk.	,,	12½	Brentford Consolidated	255—258	+2	4 16 11
300,000	,,	,,	9½	Do. New	194—196	..	4 16 11
50,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
206,250	,,	June 11	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
220,000	Stk.	Mar. 12	10¾	Brighton & Hove Orig.	212—214	..	5 0 6
246,320	,,	,,	7¾	Do. A Ord. Stk.	154—156	..	4 19 4
460,000	20	Apl. 16	10	British	43—43½	+¼	4 11 11
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	119—121	..	4 19 2
165.700	,,	,,	4½	Do. B 3½ p.c.	89—91	..	4 18 11
82,278	,,	,,	5½	Do. C 5 p.c.	108—110	..	5 0 0
5[illegible],000	,,	June 25	3½	Do. 3½ p.c. Deb.	88—90*	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13¾—14¼	..	4 18 3
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	92—94*	..	4 5 1
100,000	10	—	—	Cape Town & Dis., Ltd.	4[illegible]—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5½—6	..	—
50.000	50	May 3	6	Do. 6 p.c. 1st Mort.	48—49	..	6 2 5
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84*	+2	5 7 2
157 150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,493,280	Stk.	Mar. 12	5 2/10	Commercial 4 p.c. Stk.	108—110	..	4 14 6
560,000	,,	,,	5	Do. 3½ p.c. do.	104—106	..	4 14 4
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	96—98	..	5 2 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137—139	..	5 0 9
493,270	Stk.	—	5	Derby Con. Stk.	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
143,995	,,	Mar. 31	5	East Hull 5 p.c. Ord.	100—102	..	4 18 0
486,[illegible]90	10	Jan. 28	12	European, Ltd.	24¾—25¼	+½	4 14 10
354,[illegible]60	10	,,	12	Do. £7 10s. paid.	18¾—19¼	+¼	4 13 6
15,161,545	Stk.	Feb. 11	4/10/8	Gas light and Coke 4 p.c. Ord.	103—104	..	4 7 0
2,600,000	,,	,,	3½	Do. 3½ p.c. max.	88—90	+½	3 17 9
3,799,735	,,	,,	4	Do. 4 p.c. Con. Pref.	104—106	—1	3 15 6
4,193,975	,,	June 11	3	Do. 3 p.c. Con. Deb.	85—86	+½	3 9 9
258,740	Stk.	Mar. 12	4¾	Hastings & St. L. 3½ p.c.	93—95	..	5 0 0
82,500	,,	,,	6¼	Do. do. 5 p.c.	118—120	..	5 4 2
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17½—18	..	6 2 3
123,5[illegible]0	Stk.	Mar. 12	6½	Ilford A and C	141—143	..	4 10 11
65,780	,,	,,	5	Do. B	106—108	..	4 12 7
63,000	,,	June 25	4	Do. 4 p.c. Deb.	102—104*	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental	179—181	..	4 8 5
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	120—122	..	4 18 4
561,000	Stk.	Feb. 25	10	Liverpool United A	226—228	..	4 7 9
718,100	,,	,,	7	Do. B	168—170	..	4 2 4
306,083	,,	June 25	4	Do. Deb. Stk.	103—105*	..	3 16 2
75,000	5	June 11	6	Malta & Mediterranean.	4⅞—5⅛	+⅛	5 17 1
560,000	100	Apl. 1	5	Met of Melbourne 5 p.c. Deb.	100—102	..	4 18 1
250,000	100	,,	4½	Do. 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	May 27	3½	Monte Video Ltd.	12½—13	..	5 7 8
1,775,892	Stk.	Feb. 25	4½	Newc'tle & G'tesu'd Con.	107½—108½	+1	4 2 11
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	91—93*	+½	3 15 3
15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½—20	..	5 0 0
55,940	10	,,	7	Do. 7 p.c.	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	137—139	..	5 15 1
60,000	5	Mar. 31	8	Ottoman, Ltd.	6⅛—6⅜	..	6 5 6
3[illegible],800	53	Feb. 25	13	Portsea Island A.	137—139	..	4 19 0
60,000	50	,,	13	Do. B.	129—131	..	4 19 3
100,000	50	,,	12	Do. C.	119—121	..	4 19 2
114,800	50	,,	10	Do. D and E.	101—103	..	4 17 1
398,490	5	May 13	7	Primitiva Ord.	6¾—7	..	5 0 0
796,980	5	Jan. 28	5	Do. 5 p.c Pref.	5¼—5½	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
1,000,000	10	Apl. 29	8	River Plate Ord.	14¾—15¼	..	5 4 11
312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96—98*	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd.	14—14½	..	5 10 4
62,500	10	,,	6	Do. 6 p.c. Pref.	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49½—50½*	..	4 19 0
135,000	Stk.	Mar. 12	10	Sheffield A	236—238	..	4 4 0
209,98[illegible]	,,	,,	10	Do. B	233—235	..	4 5 1
523,5[illegible]0	,,	,,	10	Do. C	233—235	..	4 5 1
70,000	10	June 11	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	122—124	..	4 6 0
1,895,445	,,	Jan. 14	3	Do. 3 p.c. Deb.	85½—86½	+½	3 9 4
209,82[illegible]	Stk.	Mar. 12	8	South Shields Con. Stk.	152—154	..	5 3 11
605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120—122	..	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
117,058	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124—126	..	3 19 4
502,310	Stk.	May 13	5	Southampton Ord.	110—112	..	4 9 3
120,000	Stk.	Feb. 25	6¾	Tottenham and Edmonton A 5 p.c.	132—134	..	5 0 9
423,940	,,	,,	5¼	Do. B 3½ p.c.	111—113	..	4 12 11
149.470	,,	June 25	4	Do. 4 p.c. Deb.	99—101*	..	3 19 3
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101*	..	4 19 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	109—111	..	4 10 1
255,6[illegible]6	Stk.	Feb. 25	6½	Wandsworth B 3½ p.c.	139—141	..	4 12 2
79,416	,,	June 25	3	Do. 3 p.c. Deb. Stk.	73—75*	..	4 0 0
895,872	,,	Feb. 25	5¼	West Ham 5 p.c. Ord.	121—123	..	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref.	126—128	..	3 18 2
253,300	,,	June 25	4	Do. 4 p.c. Deb. Stk.	105—107*	..	3 14 9

Prices marked * are "Ex div."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A very complimentary article with reference to the position of the Dundee Corporation gas undertaking was pubished in the "Dundee Advertiser" on Monday last, in which it was stated: "It is only by a careful comparison of the figures that the progress of the Dundee gas undertaking since it was put under the management of Mr. Yuill can be realized. He took command in 1903, when the quantity of gas delivered from the works was 665,202,000 cubic feet. Since then the quantity has increased by 210,145,000 cubic feet; being now 875,347,000 feet. In the automatic meter department there has also been a phenomenal development; the total number in use during the same period having increased from 5163 to 15,606—an excess of 10,443. The popularity of gas-stoves has grown with extraordinary rapidity. The total in use is now 17,222, as compared with 787 in 1903—being an increase of 16,435. Still, the full tale has not been told, for the total number of consumers in 1903 was 41,906, while in 1909 it had mounted up to 47,880—an increase of 5920. So much for increases. But there have been decreases, which are just as eloquent of progress. The capital debt on the undertaking per million cubic feet of gas sold in 1903 was £641; while now it stands at £433. The total capital debt has been reduced from £426,426 to £378,717. Last, but not least, the price of gas in 1903 was 3s. 6d. per 1000 cubic feet; and now it is 2s. 3d. This last reduction means a saving of £55,000 a year to the consumers. As a rise in rates means a reduction in wages, so a reduction in rates means a rise in wages. Therefore we have a rise in wages since 1903 of £55,000. Since Mr. Yuill was appointed Manager, he has practically remodelled the works. This is all very gratifying, especially in view of the fact that other departments are raising the rates equal to a reduction in wages of about £20,000 a year. Mr. Yuill is one of those men who might properly be called a gas-works statesman. The gas-works are his pride."

In view of the controversy which raged in Selkirk in the autumn of 1907, over the proposed transfer of the Gas Company's undertaking to the Corporation, which, it may be remembered, was rejected by the ratepayers, some interest attaches to a statement by ex-Provost Sim, which was published in the "Southern Reporter" on Thursday. In this communication it is stated: "The Directors of the Selkirk Gas Company have issued their annual report to their shareholders, and a more interesting document, or one conveying more instruction to the ratepayers of Selkirk, it would be difficult to find. Its outstanding points are: The profit (£1416) is the largest in the history of the Company; the dividend recommended is 12½ per cent. on the share capital, the same as for the previous year; and the Directors recommend that the share capital be increased from £4535 to £20,000 (£18,140 issued). This means in effect that the shareholders are to get a £20 share for each of their £5 shares. Notwithstanding this record profit, and notwithstanding a reduction of 6d. per ton in the price of coal last year, and a further reduction this year of probably 6d. to 1s. per ton, the Directors recommend no reduction in the price of gas. Contrary to the practice of the last two years, but no doubt for good reasons, the price of coal under the new contract is not disclosed. Just two years ago, when there was a smaller profit, and when there was an increase of 10¾d. per ton in the price of coal, but when the Town Council were fighting the Company, the consumers got a reduction of 2½d. per 1000 cubic feet on the gas. These recommendations, if adopted, as no doubt they will be, will in July of next year provide a profit which will enable the Company, after making adequate provision for depreciation, to pay a dividend of 5 per cent. on the new £20 shares. It looks a very modest dividend; but the modesty is all in the look. It is exactly 20 per cent. on the present share capital. . . . A year-and-a-half ago, the Town Council, whose business it is to attend to the interests of the burgh, after long and difficult negotiations, arranged with the Directors of the Company a bargain which, if it had been confirmed by the ratepayers, would have meant, on the past year, after payment of interest and sinking fund on the loan, a clear profit of £600 to the burgh. A majority of the small number of ratepayers who were sufficiently interested to vote in the plebiscite . . . declined to confirm the bargain, with the result that the £600 has gone into the coffers of the Gas Company instead of into those of the burgh; and year after year still larger sums will follow the same course."

The annual meeting of the Stirling Gas Company was held on Tuesday—ex-Provost Kinross presiding, in the absence, through illness, of Mr. James Johnston, the Chairman. The Directors reported that the expenditure on capital account had been £239; that the balance at the credit of the revenue account, after providing for ordinary maintenance and repair, amounted to £7665, to which had to be added £417 brought forward from the previous year; and that, after payment of interest on mortgages, income-tax, and dividend on the preference shares, there remained a balance of £7001 at the credit of the profit and loss account. Out of this they recommended payment of dividend on the original capital at the rate of 9s. 5½d. on each share of £5 7s. 6d., and on the new ordinary shares at the rate of 11s. per share on each £10 share, amounting to £4537, less income-tax; that £259 be carried to the insurance fund, making it, with accrued interest, £3500, which completed the sum available for the insurance fund under the present amount of capital issued, as a consequence of which the interest accruing to the fund will now be available for dividend; and that the balance of undivided profits, amounting to £2436, be carried forward. The Chairman made reference to the satisfactory nature of the year's working. The report was adopted. The price of gas has been reduced to ordinary consumers to 2s. 6d. per 1000 cubic feet from May 15.

A statement made in these "Notes" on the 29th ult., regarding the capital of the Leven and Methil Gas Company, Limited, has, I see by the paragraph added to my "Notes" last week, been repudiated by the Chairman of the Company, who says it does not apply to them. A mistake has undoubtedly been made. The statement was taken from

ıe "Fife Free Press" of the 26th ult. The explanation of how the :ror came to be made, I have no doubt, is that the paragraph was in- ɜrted in that newspaper under the wrong heading.

The Directors' report of the Stonehouse Gas Company, Limited, dopted by the shareholders at their annual meeting, gave a very satis- ıctory account of the year's working. The Collector reported that in ıe year 66 new consumers were added, and during the last three ears 123.

The make of gas of the Bellshill Gas Company, Limited, during the ast year was 29,425,000 cubic feet—an increase over the previous ear of 1,267,000 cubic feet. The large extensions to the works and ew plant completed during the year are now working most satis- ıctorily. The railway siding now completed and being used has roved a great convenience and saving to the Company. A dividend f 5 per cent., free of income-tax, was declared.

The Lochgelly Gas Company, Limited, had a make of gas last year f 26½ million cubic feet—an increase of fully 8½ millions over the revious year. This is the largest increase in the history of the Com- any. A dividend at the rate of 7½ per cent. was declared; £450 was dded to reserve fund, and £411 carried forward. A recommendation y the Directors to erect a sulphate of ammonia plant at the works was pproved of.

The report of the Directors of the Kelty Gas Company, Limited, tates the income for the past year at £3585, and the expenditure at 2483; leaving a balance of £1102. The Directors recommend a ividend of 7½ per cent., and propose to abolish meter-rents.

At the annual meeting of the Cupar Gas Company, Limited, on 'hursday (a synopsis of the accounts of which was given last week), ıe Chairman—Mr. J. E. Grosset—said that by reducing the price of as to 3s. 10½d. per 1000 cubic feet they reached the lowest figure for as sold by the Company. A matter which had been brought before ıe Directors by the Manager was the proposed introduction of plant ɔr the manufacture of sulphate of ammonia. The outlay would mount to £600, and, after debiting 5 per cent. on the capital, it was alculated that there would be a profit of about £90. In the event of ıe proposal being carried out, it was suggested that they should raise dditional capital, with which to pay up an existing loan of £1000, and ɜave a balance of working capital. The new capital would consist of ɜares to the amount of £2000. It was also proposed to increase the mount of the present ordinary shares from £25 to £30. The report 'as adopted.

The Blairgowrie Gaslight Company have paid a dividend of 5 er cent., and reduced the price of gas from 5s. 6d. to 5s. 3d. per ooo cubic feet.

The Directors of the Methven Gas Company are now considering ıe introduction of a gas supply from the Perth Corporation, instead of ıaking gas from petrol.

The Alyth Gaslight Company have paid a dividend of 5 per cent., ɔe same as last year, and have voted the usual honoraria to the Ianager and his Assistant.

At the annual meeting of the Markinch Gas Company—Provost Dixon presiding—a dividend of 5 per cent. was declared. It was resolved to expend about £500 at once on the erection of a new scrubber and washer and the construction of a new retort-bench on the regenerative system. In consequence of the Town Council having under consideration the question of acquiring the Company's undertaking, Provost Dixon, who is the Chairman of the Company, and the other Town Council members and officials who have seats on the Board, retired from office, and other shareholders were elected Directors in their stead. It was agreed to reduce the price of gas from 4s. 7d. to 4s. 4d. per 1000 cubic feet.

At a meeting of the Cupar District Committee of Fife County Council on Tuesday, a long correspondence with Mr. W. Key in regard to gas-pipes in the roadway at Ceres was submitted. Mr. Key alleged that several gas-pipes have been destroyed, owing to the working of the road-roller. He asked the Committee to send men to strip the main, with a view to having the pipes repaired. The Committee resolved to reply to Mr. Key that they did not see their way to comply with his request, as they did not consider that they were liable for any damage which might have been done.

The Kirkcudbright Town Council have accepted the tender of Messrs. James M'Kelvie and Co., of Edinburgh, to supply for next season's use in the gas-works, 300 tons of Sanquhar splint, at 13s. 6d. per ton, and 100 tons of Sanquhar double nuts, at 11s. 10d. per ton, delivered at Kirkcudbright.

Considerable changes have been made lately in the gas offices of the Peterhead Corporation. The office of the Engineer and Manager (Mr. William Ritchie) is now a neat little edifice; and the general office has been much improved. In conjunction with these changes, new buildings have been erected for the employees. Altogether quite a transformation has been effected in the neighbourhood; and gas consumers and others must be pleased to notice the improvement.

The Edinburgh and District Water Trust on Thursday adopted a scheme of reorganization of offices and salaries. The Treasurer—Mr. W. Anderson—is to retire at Sept. 30 next, and the offices of Treasurer and Collector are to be conjoined, Mr. J. Oliver, the Collector, receiving the appointment interim. The offices of Clerk and Law Agent are to be conjoined in Mr. W. Boyd, W.S., the present Clerk. The offices of Engineer, held by Mr. W. A. Tait, C.E., and Superintendent of Works, held by Mr. W. Black, are to be conjoined in Mr. Tait. The salaries payable have been: Treasurer, £650; Collector, £550; Clerk, £615; Engineer, £600; and Superintendent, £500. Under the new arrangement, the salaries will be: Treasurer and Collector, £500; Clerk and Law Agent, £615; and Engineer and Superintendent, £600, rising by increments of £25 to £900. Messrs. J. & A. Leslie and Reid, C.E., who have been Engineers to the Trust since it was instituted, and of which firm Mr. Tait is a member, are appointed Consulting Engineers, at a retaining fee of £300; and the retired Superintendent is to receive £200 a year. The new scheme of salaries effects a saving of £850 a year.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *July* 10.

Again there has been a quiet market, and though towards the close there has been rather more demand, prompted probably by the heavy shipments in June, prices have on the week barely been maintained. The closing quotations are £11 1s. 3d. per ton f.o.b. Hull, £11 2s. 6d. to £11 3s. 9d. per ton f.o.b. Liverpool, and £11 5s. to £11 6s. 3d. per ton f.o.b. Leith. The forward position has been neglected, buyers refusing to pay the premium on spot prices required by makers; and no important first-hand business has transpired.

Nitrate of Soda.

This market has been weak in all positions, and the local spot prices are down to 9s. 10½d. per cwt. for 95 per cent., and 10s. for refined quality, *ex* store.

Tar Products. LONDON, *July* 12.

Markets for tar products have been steady throughout the past week. Pitch has been firm, with the price unchanged. The majority of makers in England are very well sold, and are not inclined to do any further business unless they can obtain an advance on the present quotations. On the other hand, Continental consumers seem to think they will do better by waiting; and they decline to purchase even at the equivalent of the prices quoted to-day. As, however, the manufacturers are well sold, and it is known that many of the Continental consumers have still a considerable quantity to purchase for this year's delivery, it would appear that, by waiting, the manufacturers in this country will obtain their price. The market for creosote is firm, and prices are unaltered. There is considerable inquiry, but at present buyers are rather adverse to giving the prices asked. Benzol 90 per cent. is steady, and there appears to be a better demand all round. For 50-90 per cent. benzol there is also a fair demand, though buyers are not willing to pay the figures asked. Solvent naphtha is quiet, especially in the North. For heavy naphtha, there is little or no demand. Carbolic acid is very depressed, and Continental consumers advise that they have purchased at 11d. for prompt delivery.

The average values during the week were: Tar, 14s. 6d. to 18s. 6d., *ex* works. Pitch, London, 28s.; east coast, 27s. 6d. to 28s.; west coast, 26s. 6d. to 27s. 6d. f.a.s. Mersey ports, 26s. to 27s. f.o.b. others. Benzol, 90 per cent., casks included, London, 6d. to 6½d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6¾d. to 7d. Toluol, casks included, London, 8¼d. to 8½d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3⅛d.; solvent naphtha, casks included, London, 10¾d. to 11¼d.; North, 9½d. to 10d.; heavy naphtha, casks included, London, 10½d. to 11d.; North, 9½d. to 10½d. Creosote, in bulk, London, 2¾d. to 2$\frac{13}{16}$d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2⅞d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 11d. to 11½d.; west coast, 10½d. to 11d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been quiet during the past week; but prices are practically unchanged, though some business has been done for forward delivery at fair figures. Beckton prompt is £11 7s. 6d., and ordinary makes on Beckton terms £11. In Hull, £11 to £11 1s. 3d. is asked; and in Liverpool, £11 2s. 6d. In Leith, £11 6s. 3d. to £11 7s. 6d. is quoted.

COAL TRADE REPORTS.

Northern Coal Trade.

Though there is still some irregularity in the coal trade, there is an approach to more normal prices, and the output seems to be ample for all present requirements. In the steam coal trade, best Northumbrians are from about 12s. to 13s. per ton f.o.b., second-class steams are 11s., and steam smalls are quoted from about 5s. to 6s. Exports have been very heavy; and about 8000 tons per day have been sent from the Tyne to Hamburg alone for some weeks. In the gas coal trade, the shipment on contracts is beginning to increase, and the home requirements must now be expected to grow. Durham gas coals are quoted from about 9s. 9d. to 11s. per ton f.o.b., according to the quality, for the usual classes, and up to 11s. 6d. for "Wear specials." Not many new contracts are now being booked; but the collieries appear to have their production well sold, more particularly for best qualities of gas coals. The demand is heavy in consequence, and the producers ask prices that are relatively high, especially if the period of delivery is far forward. In coke there is a good demand. Gas coke being low in the output, the price is steady at from 12s. 6d. to 13s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The situation is a little more serious than it has been, in respect that the coalmasters have decided to issue notices to the effect that a reduction of the miners' wages by 6d. per day will be enforced after the 26th inst. But much may happen before then. Neither side seems to be anxious for a struggle; and there may yet be a compromise. There is a large demand for coal. The shipping season is at its height; and ell is being largely sought for by foreign buyers. Splint is more sought after for the home market, the price looking up. There is also much inquiry for washed stuffs and dross. The prices quoted are: Ell 9s. 9d. to 11s. 3d., splint 10s. 3d. to 10s. 6d., and steam 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 345,921 tons—a decrease of 14,107 tons upon the preceding week, but an increase of 11,395 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,393,599 tons—an increase of 524,631 tons upon the corresponding period.

Whitland and District Water and Gas Company.

In the Chancery Division of the High Court of Justice last Tuesday, before Mr. Justice Eve, the case of *Main Limited v. Whitland and District Water and Gas Company* was mentioned by Mr. Owen Thompson. He said he had to move for judgment in default of defence by consent in a debenture holder's action. There was just one point. The time during which the Manager was to carry on the concern expired on the 26th of June. The matter had come before the Master; but the evidence was not quite in order, and he directed Counsel to mention it to his Lordship, and ask him to extend the time. He had an affidavit from the Receiver and Manager, who said that the business was self-supporting at present; and if time was given he hoped to sell the concern to a Syndicate. He asked that the time of the Manager should be extended to the 31st of October; and his Lordship assented.

Extensions at the Rhyl Gas-Works.

There has just been completed at Rhyl, by Messrs. R. Dempster and Sons, Limited, a very smart piece of work, in the erection of a three-lift Gadd holder of the following dimensions: Inner lift, 64 ft. 6 in. by 18 ft.; middle lift, 67 ft. by 18 ft.; outer lift, 69 ft. 6 in.—the whole having a capacity of 178,000 cubic feet. The order was placed on the 10th of March, and included the removal of an old single-lift holder with lattice girder and cast-iron columns. The removal of the holder was started on the 15th of April, and the erection of the new holder was commenced on the 12th of May, and completed on the 18th of June. The tank was filled by June 22, and the holder was tested by the 25th of June. The actual number of working days on the erecting was 33 only, which speaks volumes for the accurate way in which the ironwork was prepared at the Contractor's works, and the expeditious manner in which the holder was put together.

Inverted Incandescent Lighting in Deptford.

In a report issued on Saturday, the Lighting Committee of the Deptford Borough Council stated that it was arranged in January last that certain of the street-lamps should be fitted experimentally with inverted burners, in place of the upright burners now generally in use. The inverted burners had been installed in the lamps along New Cross Road, from New Cross Gate to the Broadway; and there could be no doubt that they gave a greatly improved light, which appeared to fully bear out the statement of the South Metropolitan Gas Company that the inverted burner gave a light of 120 candles, compared with only 80 candles for the upright burners. The Committee had been in communication with the Company on the subject of replacing the No. 4 burners with the new inverted type, and were informed that this would cost 3s. for each burner; a similar cost being incurred in the case of the conversion of the No. 3 burners to the inverted type. Nos. 4 and 3 are those in use in the main roads; the burners in use in side streets being known as No. 2. The Company have given notice that, by reason of the lower price for gas which came into operation at Midsummer, the annual charges for the maintenance of the Nos. 2, 3, and 4 burner lamps would be reduced by 11d., 1s. 3d., and 1s. 7d. respectively—that is, to an annual charge of £2 8s. 3d., £2 15s. 6d., and £3 2s. 10d. respectively. The Company further stated that they would now, by the reduced cost of upkeep and the lower charge for gas, be enabled to make a uniform charge for the maintenance of lamps fitted with the new inverted burner replacing Nos. 3 and 4 upright burners, of £2 19s. 6d. per annum. There are 244 No. 4 burners, and 13 No. 3 burners; and it would therefore be seen that the cost of replacing these 256 burners with the new type would be £38 8s., and that the saving in the cost of maintenance, by the adoption of the new burner, would be £38 5s. 4d. annually, in addition to which the great increase of the illuminating power consequent upon the substitution must be borne in mind. The Committee decided, under the foregoing circumstances, that the whole of the Nos. 3 and 4 burners of the street-lamps in the borough should be replaced by those of the inverted pattern. The question of replacing the No. 2 burners is still under consideration.

Sales of Shares.—At the Royal Hotel, Barnsley, last Wednesday, Messrs. Lancaster and Sons sold three "G" £10 shares in the Barnsley Gas Company at £15 each. They also sold some 10 per cent. shares in the Worsboro' Gas Company (£2 10s. paid) at £5 5s. apeice; some 5 per cent. "B" shares (£2 10s. paid), at £2 13s. each; and some 7 per cent. "C" shares (£2 10s. paid), at £3 17s. per share. At a recent sale by Messrs. Dodds and Hudson, £800 of the general stock (1878) of the Normanton Gas Company was disposed of at from £231 to £233 per £100 of stock; and £100 of original stock of the East Ardsley Gas Company at £105. On the same occasion, some £10 shares in the Wakefield Gas Company were offered for sale, and withdrawn at £18 10s.; but some were afterwards disposed of privately at an advance of 5s. A parcel of £5 "B 5th" shares in the same Company fetched from £10 5s. to £10 7s. apiece.

No Allotment of "Homoil" Shares.—In the "Journal" for the 29th ult., it was announced that the "Homoil" Trust had been registered with a capital of £150,000, in £1 shares, to acquire, deal with, and turn to account certain British patents relating to inventions for apparatus for carburetting "homoil" (a substitute for petrol), for use in internal combustion engines and illuminating and other purposes. The announcement of the registration was followed by a series of adverse criticisms in the "Financial News," culminating in the question: "What will the Board do?" The answer was given by the Board deciding on Tuesday last not to go to allotment, but to return the application money in full. Referring to the matter next day, our contemporary said: "It was a wise decision. We understand that originally two members of the Board out of its total of four were in favour of proceeding to allotment; the other two being opposed to it in view of the criticism and dissection which the prospectus had undergone. Ultimately it was decided that the safer course lay in the direction of the return of the money."

Training Gas-Fitters at the Westminster Technical Institute.—At the meeting of the London County Council last Tuesday, the Education Committee recommended that, in place of visiting teachers of workshop drawing, arithmetic, and machine drawing, a whole-time assistant should be employed at the Westminster Technical Institute, more especially in connection with the classes for gas-fitters' apprentices, at a commencing salary of £150 a year, rising by annual increments of £10 to a maximum of £200 a year. The recommendation was adopted.

Electricity Supply Company Wound Up.—Last Tuesday, Mr. Justice Neville, sitting for the disposal of companies winding-up business, had before him a petition by Callender's Cable and Construction Company, Limited, for the compulsory winding-up of the Uxbridge and District Electric Supply Company, Limited. Mr. Peterson, K.C., in support of the petition, stated that he represented a creditor for £2210, due on a dishonoured bill of exchange. The Company, when called upon to pay, said they had no assets with which to meet the debt. The Metropolitan Electric Supply Company were also creditors, and supported the petition. Mr. Serjeant said he appeared for creditors for between £40,000 and £50,000, and supported a compulsory winding-up. His Lordship made the usual order.

New Joint-Stock Companies.—The Bell Gas Saver Company, Limited, has been registered with a capital of £12,000, in £1 shares, 4000 of which are 6 per cent. preference. The Midland Heating and Ventilation Company, Limited, with a capital of £6000, in £1 shares (2500 preference), has been formed to acquire the business carried on in Upper Trinity Street, Birmingham, as the Midland Heating and Ventilation Company, and to adopt agreements with Messrs. J. J. & W. Moffatt and W. L. White. The Patent Wood Pipe and Tube Company, Limited, has been registered with a capital of £5000, in £1 shares, to adopt an agreement with Messrs. H. P. Hansen, J. Hutchinson, and T. Dodds (trading as the Hansen Syndicate), for the acquisition of a certain invention relating to the manufacture of pipes from wood shavings.

Ashford Gas Supply.—At the last monthly meeting of the Ashford Urban District Council, the Engineer and Manager (Mr. H. R. Turner) reporting on the gas undertaking, stated that the total production of gas in the past financial year was 73,818,000 cubic feet, of which 61,600,000 cubic feet were used by the public, and 6,111,000 were unaccounted for; the latter item being a considerable reduction on the previous year. The total receipts were £15,949, and there was a net profit of £1239—the highest on record—after payment of interest on loans and the repayment of principal. A motion was submitted that the charge for the public-lamps should be reduced by 10 per cent.; but, after a long discussion, it was defeated. The mover then gave notice of a motion, to be brought forward at the next meeting, in favour of reducing the price to private consumers to 3s. 2d. per 1000 cubic feet.

The Wokingham Town Council have entered into an agreement with the Automatic Light Controlling Company for the hire of controllers to be fitted to the public lamps burning from dusk to dawn.

The Local Government Board have sanctioned the raising of £1400 by the Teignmouth Urban District Council for the provision of new purifiers; and the Gas Manager (Mr. J. A. Gray) was authorized to instruct Messrs. Willey and Co. to commence the work.

In view of the now general inclusion of cookery in the *curriculum* of educational authorities, John Wright and Eagle Range, Limited, are issuing a neat booklet, entitled "Methods of Cookery Teaching," in which they point out the advantages of their "Eureka" school cooker, which has been specially designed to enable teachers to give, in full view of the entire class, the practical demonstrations forming part of the lessons.

At the last meeting of the Hendon District Council, alternative tenders were considered for street lighting from the North Middlesex Gas Company and the Hendon Electric Supply Company. It was decided to accept the Gas Company's tender at £3 10s. per lamp per annum for a term of five years from the 1st inst.—a reduction of 2s. 6d. per lamp per annum on the price previously paid. The terms offered by the Electric Supply Company did not transpire.

It was reported at the meeting of the Bacup Town Council last Wednesday that the Lighting Committee had refused an offer from the Rawtenstall Corporation to have the streets illuminated by electricity. Mr. Smith explained that the Committee had declined because they were convinced that the present system of incandescent gas lighting was better and cheaper than the electric lighting proposed by Rawtenstall—namely, two 25-candle power metallic filament lamps to each bracket.

The annual outing of the employees of the Gorleston and Southtown Gas Company took place on the 3rd inst. at Wroxham. Breakfast was partaken of *en route* at Ormesby, and after a short stay the drive was resumed to Wroxham—dinner being served at the King's Head Hotel. Mr. J. Witten, the Engineer, presided, supported by Mr. E. Keable, the Assistant-Engineer, and Mr. W. Poll, the foreman. After dinner votes of thanks were accorded to the Directors for their continued liberality; to Mr. Witten for his assistance in arranging for the outing, aided by Mr. Keable; and also to Mr. Poll for the energetic way in which he had carried out his duties as Secretary and organizer of the trip. After a short stay at Wroxham, the party journeyed to Acle, where they had tea at the King's Head Hotel. After having spent a very enjoyable day, home was safely reach about ten o'clock.

What has become an annual event which is looked forward to with much pleasure by those who are privileged to be present took place last Thursday afternoon on the grounds of the Fulham works of the Gaslight and Coke Company, when the fourth cricket match was played between the staff and the workmen of the Company's Inspectors' Department, on the invitation of the Chief Inspector, Mr. F. W. Goodenough. The weather proved kind; and a most enjoyable time was spent in watching the cricket, taking tea, and listening to the brass band of the Company (Kensington and Fulham Division). As there was not sufficient time to get through the second innings, the game had to be decided upon the first innings, in which the staff (under the captaincy of Mr. Goodenough) scored 77 runs, while the workmen (under the captaincy of Mr. J. Bevis) knocked up 61 runs. In the second innings, so far as it was played, the workmen did much better, and the staff not nearly so well. The duties of Hon. Secretary were energetically performed by Mr. E. Pilbrow, Inspector in Charge at Kensington and Harwood Terrace.

The report of the British Consul at Porto Alegre (Brazil), which has just been issued, sets forth that the city proper is chiefly lighted by gas furnished by a native Company, who have recently renewed their contract with the Municipality, though there is a possibility that the latter may, at an early date, expropriate it at a valuation. The Company also have the illumination of Rio Grande and Pelotas, the head office being the latter place. The concession for these three towns originally belonged to a British Company, who established the service; but difficulties arose with the then Provincial Government, from whom the concession was obtained by a Frenchman, who sold it to a British Company, and the latter disposed of it to the present owners at a heavy loss—the price barely recouping the debenture holders. The Municipality now have the granting of all municipal concessions. One for supplying electric light to private consumers within a limited zone of the city, included in the part also supplied by the Gas Company, is held by a native Company; but at the date of writing the concession was about to expire, when the whole of the town and suburbs will be open to all comers, as the Municipality do not reserve any monopoly.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

MANAGER. Gas Company, Kingsbridge. Applications by July 31.
WORKS MANAGER. Bollington Urban District Council. Applications by July 31.
JUNIOR CLERK. No. 5116.

Situations Wanted.

MANAGER OR ASSISTANT. No. 5112.
SULPHATE LEADWORK. Leadburner, 117, Gallaway Road, Shepherd's Bush.

Correspondence Courses in Gas Engineering and Supply—W. Cranfield, Halifax.

Stocks and Shares.

EPSOM AND EWELL GAS COMPANY. July 26.
NEWCASTLE AND GATESHEAD WATER COMPANY. July 27.

TENDERS FOR

Coal and Cannel.

LYMM URBAN DISTRICT COUNCIL. Tenders by July 21.
STRATFORD-UPON-AVON GAS DEPARTMENT. Tenders by Aug. 21.

Oxide of Iron.

LLANDUDNO URBAN DISTRICT COUNCIL. Tenders by July 25.

Tar and Liquor.

COVENTRY GAS DEPARTMENT. Tenders by July 19.
LYMM URBAN DISTRICT COUNCIL. Tenders by July 21.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

MR. WM. CRANFIELD, F.C.S., in re- sponse to requests, has decided to extend the work he has been carrying on by Gas Classes in various Yorkshire Towns for the past Ten Years, and to organize postal courses of Tuition in "Gas Engineering" and "Gas Supply." Close personal attention will be given to the needs of each individual Student, and Expert Assistance has been engaged. All Inquiries treated confidentially.

Full Particulars on Application to No. 11, Avondale Place, HALIFAX.

WANTED, a Manager, for Gas-Works with an Annual Make of 12 Millions. Must be Practical Carbonizer, Good Working Mechanic, and have General Knowledge of Accounts. Secretary employed.

Applications, stating Age, Experience, &c., must be addressed to the CHAIRMAN, Gas Company, KINGSBRIDGE, and received on or before July 31.

BOLLINGTON URBAN DISTRICT COUNCIL.

THE Council require the Services of a WORKS MANAGER at their Gas-Works.

Applications, stating Age and Salary required, to be sent in not later than Saturday, the 31st of July, 1909, on Forms to be obtained from me.

By order,
SAMUEL KNIGHT,
Clerk.

Council Offices, Bollington,
Near Macclesfield, July 10, 1909.

PURIFIERS—Set of Four, 12 feet Square, fixed complete, £300. A bargain. Also Four 6 feet Square, Two 8 feet, Four 8 feet, and Two 12 feet square PURIFIERS. Cheap.

FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

GASHOLDERS—Splendid, 45 feet dia- meter, and New STEEL TANK fixed complete, £600 to Plan and Specification. Also 50 feet Single-Lift and 50 feet Double-Lift. Cheap, with STEEL TANKS. Can be seen temporarily erected.

FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

WASHERS and Scrubbers — Two "Livesey" WASHERS. One "Clapham" WASHER. TOWER-SCRUBBERS, 3 ft. 6 in. by 16 ft., 4 ft. by 16 ft., and 7 ft. diameter by 55 ft. high. Sold at Bargains, being overstocked.

FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

CONDENSERS—Clapham's, also Cutler's Water-Tube CONDENSERS. Pipe CONDENSERS, 4-inch to 10-inch diameter. Annular CONDENSERS, 8-inch, 10-inch, and 12-inch. Erected Complete and Cheap.

FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

STATION Meters and Governors— Several in Stock, 4-inch to 18-inch, with New Drums. Prompt Execution.

FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

PUMPS, Tanks, &c.—Two and Three- throw PUMPS, Belt or Steam Driven, and Single and Double-acting Verticals and Horizontals. Large Stock of Tanks and all Sundries.

FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to receive TENDERS for the Supply of CANNEL and Best Screened GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of Twelve Months from the 1st day of September, 1909.

The probable Quantities required will be about 300 Tons of Cannel and about 2000 Tons of Gas Coal, which must be Freshly-Wrought, well-Screened, and free from Sulphurous Pyrites and other objectionable matter; but the Council reserve the right of increasing or decreasing the Quantities named.

The person whose Tender is accepted will be required to enter into an agreement with the Council for the due performance of his Contract.

Sealed Tenders, stating Price per Ton delivered by Boat alongside the Works, to be sent to the undersigned on or before the 21st of July, 1909, and endorsed "Coal Tender."

The Council do not bind themselves to accept the lowest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to the Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,
Clerk.

Council Offices, Lymm,
Cheshire, June 30, 1909.

TAR AND AMMONIACAL LIQUOR.

THE Lymm Urban District Council are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works, for a term of One Year from the 1st day of September, 1909 (or for such longer term as may be contracted for with the consent of the Council).

Tar and Liquor will be delivered free into Contractor's Boat on the Bridgwater Canal.

Tenders to be sent to the undersigned on or before the 21st day of July, 1909, endorsed "Tar."

The purchaser will be required to enter into an Agreement with the Council for the due performance of his Contract.

The Council do not bind themselves to accept the highest or any Tender.

Forms of Tender are not Supplied.

Further Particulars may be had on Application to the Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,
Clerk.

Council Offices, Lymm,
Cheshire, June 30, 1909.

THE Gas Committee of the Coventry Corporation invite TENDERS for the Purchase of Surplus TAR produced at their Gas-Works for the Twelve Months commencing Aug. 1 next.

Estimated Quantity of Surplus Tar, 3500 Tons.

Form of Tender and Conditions of Contract may be obtained on Application to the undersigned.

The Committee do not bind themselves to accept the highest or any Tender.

Sealed Tenders, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, endorsed "Tender for Tar," must be delivered not later than Nine a.m., on Monday, the 19th inst.

FLETCHER W. STEVENSON,
Engineer and General Manager.

Gas-Works, Coventry,
July 1, 1909.

STRATFORD-UPON-AVON CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply of 6000 Tons of Good Screened GAS COAL or NUTS, for delivery during the Twelve Months ending Sept. 30, 1910.

Forms of Tender and other Particulars can be obtained upon Application to the Engineer and Manager.

Tenders to be sent in (and will be accepted only on the Forms supplied) not later than Aug. 21, 1909.

The lowest or any Tender not necessarily accepted.

J. S. CRANMER,
Engineer and Manager.

July, 1909.

THE Llandudno Urban District Council invite TENDERS for the Supply of 100 Tons of OXIDE OF IRON, either Bog Ore or Specially prepared, and for the Purchase of SPENT OXIDE.

In the alternative, Tenders are also invited for the Supply of OXIDE ON LOAN.

Forms of Tender may be obtained on Application to the Gas Manager, Llandudno, and Tenders must be received by the undersigned, endorsed "Tenders for Oxide," not later than Saturday, the 25th of July, 1909.

The Council do not undertake to accept the lowest or any Tender.

A. CONOLLY,
Clerk to the Council.

Town Hall, Llandudno,
July 8, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
EPSOM AND EWELL GAS COMPANY.

NEW ISSUE OF £8000 CONSOLIDATED ORDINANY STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Monday, July 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

NEWCASTLE AND GATESHEAD WATER COMPANY.

TO Be Sold by Auction, in the Board Room of the Company's Office, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, July 27, 1909, at Half-Past Twelve o'clock precisely, by Mr. Chas. A. Joel, in such Lots as are provided for in the Company's Act of 1902,

£45,000 (or thereabouts) of FIVE PER CENT. PREFERENCE STOCK (1902),

being such amount as will make up, with the Premiums thereon, the balance of Preference Stock authorized to be issued under such Act.

Printed Particulars and Conditions of Sale may be had at the Company's Offices.

GEORGE SMITH,
Secretary and General Manager.

Newcastle-on-Tyne, June 16, 1909.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large Stock in London)

PIPES and CONNECTIONS, $1\frac{1}{2}$ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

MIRFIELD GAS COAL.

UNEQUALLED.

Sperm Value 878·85 lbs. per Ton.

Please apply for Price, Analyses and Report, to the

MIRFIELD (GAS COAL) COLLIERIES

RAVENSTHORPE, NEAR DEWSBURY.

LONDON: 16, Park Village East, N.W.

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LUX'S

Gas Purifying Material

Sole Agent for Scotland:

DANIEL MACFIE,

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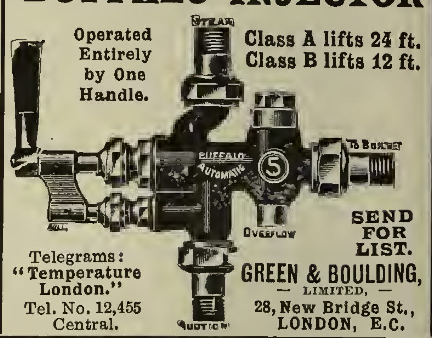
EDINBURGH.

Telegrams: "GASLUX, EDINBURGH."

'BUFFALO' INJECTOR

Operated Entirely by One Handle.



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Class B lifts 12 ft.

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Telegrams: "Temperature London."
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LIMITED,

STOURBRIDGE,

Manufacturers of

FIRE-BRICKS, LUMPS, TILES,

GAS RETORTS,

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

MIDLAND ENAMELLING CO.,

Manufacturers of

DIALS (Enamelled)

For Gas, Water, Electric, &c., Meters.

DIALS

For Pressure Scales in One Length up to 4 feet.

DIALS

For Clocks, Barometers, Thermometer Indicators, and for every purpose.

140, Finch Rd., Handsworth, Birmingham.

RETORTS

Of our Manufacture

STOP WASTE AND LEAKAGE

They are guaranteed not to contract and do not readily split and fracture but retain apparent wholeness after a long period of work.

Top Quality FIRE-BRICKS, QUARRIES, &c.

High Grade Silica Bricks and Blocks for Combustion Chambers and Special Work.

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(PATENTED PROCESS)

Awarded a DIPLOMA OF MERIT at the recent Smoke Abatement Exhibition held in the Corn Exchange, Sheffield.

The New Smokeless Fuel.

Why Gas Companies should adopt the above Process:—

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For further Particulars, apply to—

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THE WHESSOE FOUNDRY CO., LTD.,

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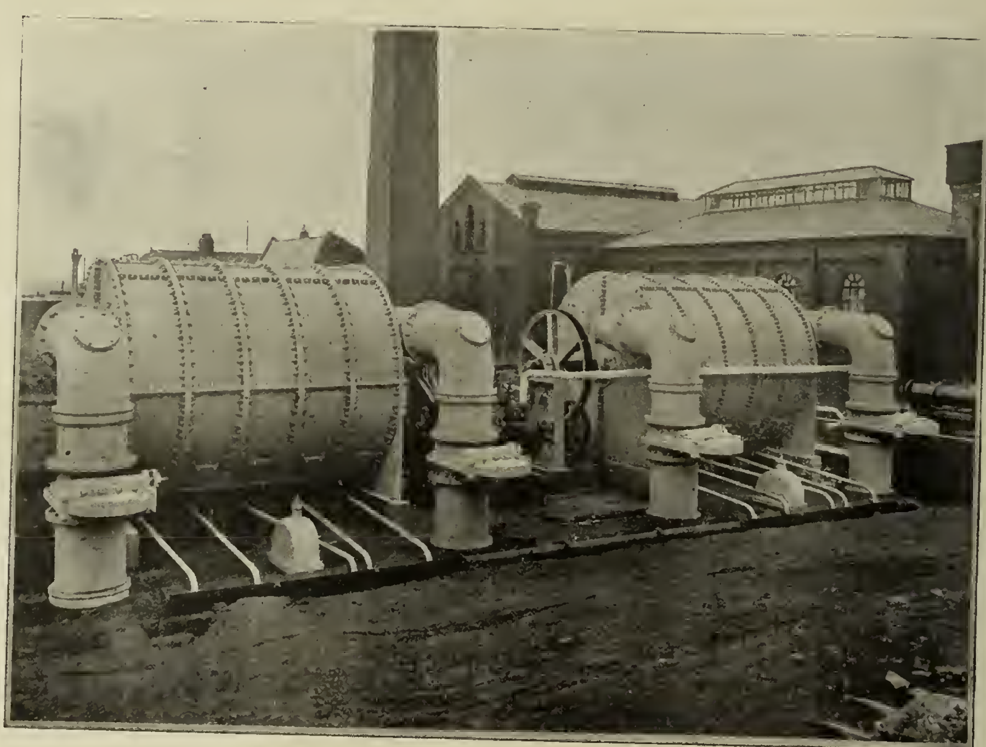
LARGE AREA OF WASHING SURFACE.

REMOVAL OF THE WHOLE OF THE AMMONIA AND A LARGE PERCENTAGE OF CO. AND SH.



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BUNDLES EASILY ACCESSIBLE FOR CLEANING.

"Whessoe" Twin Rotary Washer-Scrubber (Patent No. 24,110 of 1903). **Combined capacity 3,000,000 cub. ft. per diem,** as supplied to The Walker and Wallsend Gas Company, Newcastle-on-Tyne.

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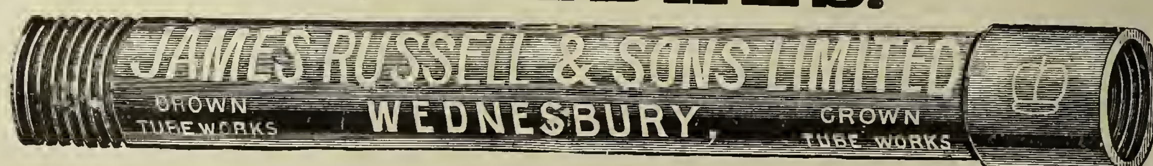

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

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GRAHAM, MORTON & CO.,
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CONVEYING
PLANTS.
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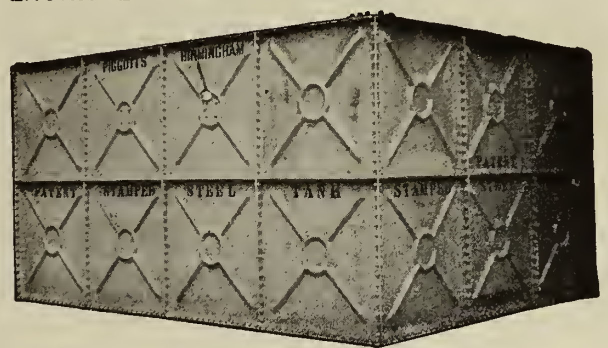
THOMAS PIGGOTT & CO.,
LIMITED,
BIRMINGHAM, ENGLAND.

IMMEDIATE DELIVERY FROM STOCK.
UNBREAKABLE.
EASILY ERECTED. LIGHT FOR SHIPMENT.



Capacity, 9600 Galls. *Size, 16 × 12 × 8 ft. deep.*

PATENT PRESSED STEEL TANKS.

MADE FROM FLANGED PLATES 4 FT. SQUARE.
ANY CAPACITY IN MULTIPLES
OF 4 FT. LENGTH, WIDTH, OR DEPTH.

HUMPHREYS & GLASGOW'S CARBURETTED
WATER-GAS PLANTS.
Aggregate capacity of Plants supplied,
223,500,000 cubic feet daily.

[T]HE "D.B." PATENT COAL PROJECTOR AND
THE "JENKINS-DE BROUWER" DISCHARGER.

71
"D.B." PATENT
COAL
PROJECTORS
AND
51
"Jenkins-De Brouwer"
DISCHARGERS
AT WORK
AND ON ORDER.

W. J. JENKINS & CO., LTD., RETFORD.

Printed and Published by Walter King, at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, July 13, 1909.

[TH]E JOURNAL OF GAS LIGHTING

[W]ATER SUPPLY & SANITARY IMPROVEMENT

[V]OL. CVII. No. 2410.] LONDON, JULY 20, 1909. [61ST YEAR. PRICE 6d.

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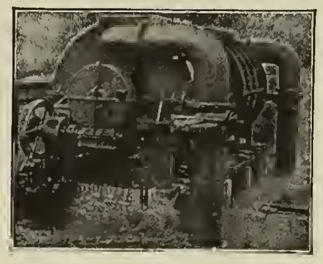

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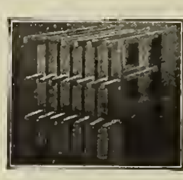

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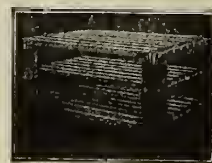

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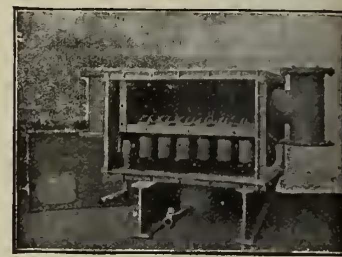

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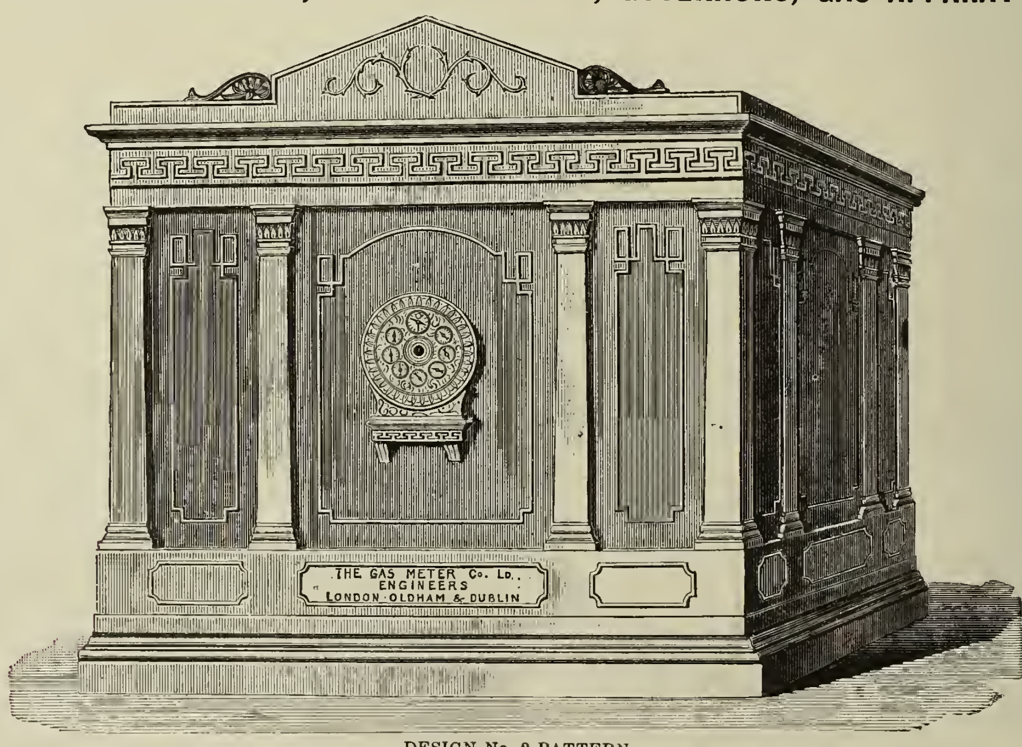

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Better Organization Needed in the Gas Industry?

ow that the applause has completely subsided, and every-e has agreed that the recent meeting of the Institution as a success in every sense of the word—a success built of interest and advantage—the time has come when the estion may be asked in all seriousness, Is the Institution efficient and sufficiently representative organization *for purposes* in the present and prospective circumstances of e gas-supply industry? For the nonce, we are going to bmit that it is not, but that as a technical organization, ven sufficient pecuniary support, it is equal to require-ent. It is at the present time the central organization of e industry; but it is neither fitted nor equipped—either ancially or constitutionally—for doing effective work tside its legitimate technical sphere. The organization is clusively professional in membership; its management entirely from within; and its objects are purely technical. s it stands as a corporate body, both in constitution and jects, it is perfectly good and sound. But it is not a body presentative of the whole of the vast interests of the gas-pply industry.

Need we look far for proof of this? Recent events supply l we require to emphasize the contention. Six months' bour and anxiety (in the course of which many reminders ad to be circulated) were requisite to bring the Livesey emorial Fund above the figure of £10,000. Scanning the rface of things for the reason of this slow response and cumulation; we are told that in these days "sentiment is not so strong as self-interest." But we see in the remark ly an appreciation of one purpose of the fund. Of the cond purpose, sight is here lost. If self-interest is stronger an sentiment in this particular instance, then surely the ject to which the fund is to be applied—which object is the technical advantage and well-being of the industry in hich so much capital has been invested—was overlooked; r that object should have been sufficient (assuming the nderstanding of the position by Boards of Directors and ommitteemen) to have produced, from the standpoint of lf-interest alone, a prompt and generous response to the ppeal. But what has actually happened? At the time e annual report of the Council of the Institution was pub-shed in June, when we were not far from the minimum sum £10,000, though there are 495 statutory gas companies in reat Britain, only 154 had subscribed to the fund, and, hough there are 276 municipal gas undertakings, only 19 ad contributed. Then again the fund for the Gas Section f the Franco-British Exhibition only attracted 148 con-ibutors. The Special Purposes Fund of the Institution as been supported but illiberally; the Benevolent Fund the ame; and Sir George Livesey was acutely astonished at the ifficulty he had in raising from gas undertakings—and he id not succeed in raising it all—the sum of only £500 a ear for the Department of Gas Engineering and Fuel at e Leeds University.

All this shows that the members of the Institution do not ontrol the money-bags of the gas industry. The members illingly attempt to influence financing to a reasonable ex-ent; but individually many have difficulty in convincing heir Directors and Committees of the need. This clearly raws the limiting line to the power of the Institution to laim to be representative of the entire gas industry. The nstitution is thus almost entirely restricted to its technical bjects; and for the prosecution of these technical objects, it as the utmost difficulty in obtaining funds. But wherefore his large amount of apathy on the part of the governing odies—the Boards of Directors and the Committees—of he gas industry? What is the secret of this great, per-istent difficulty in stimulating Boards of Directors and Gas Committees to a recognition of the needs of the industry in the matters of technical advances, in which advances are the best assurances for the future? Our own opinion is that it is all due to the fact that Boards of Directors and Municipal Gas Committees are not brought into sufficient contact with the larger work of the industry. Many of them do not appreciate the extensive ramifications of the interests of the gas industry, and of the common unity of those interests. They do not meet with any incentive to look upon their administrative position as anything more than the management of the affairs of a factory requiring purchases to be made in the cheapest market according to quality and requirement, and the realization of the best possible prices for the products consistent with the restrictions imposed by competition. Until Directors and Committeemen get out of this narrow groove, until there is a better understanding by them of the requirements of the times in connection with the gas industry, so long will the same old difficulties exist in obtaining their co-operation and material assistance in furthering the common cause. In advancing the interests of the gas industry as a whole, naturally every part—every undertaking—must benefit.

What should now be done to awaken interest in the larger affairs of the industry by administrators—apart from the technical officers—of gas undertakings? Nothing but a more intimate contact with those affairs outside their own domain will, so far as we can see, prove effectual; and that contact can only be obtained by a composite organization of, giving intercommunication between, Chairmen and deputed members of Boards and Committees and the chief technical officials of gas undertakings—a composite organization that shall treat of the general affairs of the industry (and more particularly the commercial), leaving technical questions to the qualified officers of gas undertakings to be dealt with as now through their own Institution. There are several arguments for an organization better representative of the interests of the industry than a solely technical organization can ever be. What has been said as to the trouble of raising funds is one; and what has been said as to this being due to a conspicuous want of appreciation on the part of a majority of those who hold the purse-strings, is another—this lack of appreciation being due to the absence of general communication and conference on common ground. Such appreciation requires cultivation; and the organization of the administrative interests of the gas industry would, we feel convinced, result in showing the need, and providing the ability, for more effective work being done in the future. The future will require greater co-operation than in the past. It is not by any means displaying the white-feather to prudently recognize that the times ahead will be more strenuous than the times that have been left behind. We are not so foolish as to scorn the advances of electricity in more efficient application; and it would be altogether absurd to ignore the warning of the late President of the Institution (Mr. Thos. Glover) that year by year the gas industry has to meet, and will continue to have to meet, greater and stronger competition in the residuals market. The commercial interests of the industry are not sufficiently well served by individual action alone. Something to remedy the conditions is being done by the Commercial Sections of the District Associations. But there again, representation and power are limited; and the synthetizing of the entire managerial and executive components of the gas industry would enable the absorption of the work of the sections by a body better fitted and qualified for it than a purely technical one.

In concluding this article, we desire to emphasize the fact that the submissions contained in it are intended to be suggestive, and not expressive of conclusive opinions on our part. It is a matter for full consideration and discussion. It is not supposed that such a composite body, working in co-operation with the Institution, will be brought into

existence yet; but there has been sufficient deliberation on our part over the idea to induce us to believe that—subject always to stronger adverse arguments being adduced by other men and other minds—such a body will be a necessity of the near future for bringing the whole of the useful heads of the industry into closer touch with its greater and common requirements, for general protective purposes, and for united effort in advancing its joint interests. Do we agree that the proof of something wanting is found in our recent history? If so, what is that something? Is it an organization such as that here suggested? It seems to us there are all the elements in existence for the making of an excellent aggregate, if it is considered that there would be any value in the aggregate when produced, to serve as the foundation for the industry's general work. We leave the idea, with the question in mind, Will it ever germinate and fructify?

Important Report on Street Lighting—Inverted Gas-Lamps Recommended for the City.

The high-pressure gas system, and the inverted gas-lamp, have commended themselves to the deputation of independent councillors of the City of London, headed by the Chairman of the Streets Committee (Mr. Charles A. Teuten), who were recently making investigations abroad and in the City of London, as being pre-eminently suitable for street lighting, with electric lighting taking the secondary position of being applied only where gas cannot be practically utilized in accordance with the systematic treatment the deputation advise for the City streets. Whatever may be the future of the lighting of the City, this report of the deputation, packed as it is with useful information, will stand as a veritable book of reference for lighting authorities throughout the country; and it, and the recommendations, are the more valuable in view of the unanimity of the deputation, and the absolutely open minds with which the five members set about their investigations. We cannot trace that the gentlemen referred to—Messrs. Teuten, B. Turner, J. Stopher, J. Gunton, and G. Gordon Stanham—have ever made any public pronouncement in favour of gas. They were sent out to seek the best system of street lighting; and they are of opinion that they have found what is wanted.

The unanimity of the whole of the proceedings leading up to the report is a feature for remark. In the first place, the Court of Common Council were unanimous in authorizing the Streets Committee to send a deputation abroad. The five members of the deputation sign the report, and there is no minority report; so that they, too, are unanimous in their recommendations. Then the Chairman of the Streets Committee, who was one of the deputation, signs, on behalf of that Committee, the report submitting that of the deputation without a word of criticism or adverse comment; and, when the report came before the Court of Common Council on July 1, they were unanimous in granting their consent to the Committee proceeding with further experiments, in the light of the experiences and impressions gained during their tour. This unanimity is of very considerable value and importance; and the comprehensiveness of the report places it head and front of all reports issued by any municipal body on the subject of street lighting. All who have been associated with it in any way are to be congratulated upon the thoroughness it represents. Naturally, the deputation and the report have been, and will still be, subject to the pin-pricks of those whose interests are identified with the system of lighting that the deputation have placed in a position subordinate to gas. But the City Corporation are not to be disturbed by that kind of thing. Their whole action in this matter of street lighting has shown perfect independence, and the single desire to place the City at night time under the most perfect system of lighting obtainable.

In all, eight cities abroad were visited by the deputation; and the various methods of lighting in the City of London were also inspected. As testifying that the members of the deputation were not influenced so much by what they heard as by what they witnessed, both at home and abroad, it is observed that, in their inspections abroad, they were accompanied by those officially responsible for the public lighting on both systems; and in connection with Brussels, Cologne, and Düsseldorf, it is mentioned that, in their perambulations of the cities, they were accompanied by the "chief "inspectors of electricity and other officials." The story of what they saw, and the details gathered, must be obtained from a perusal of the reproduction of the complete report in other columns. But there is one point, connected with those details and the preference for high-pressure gas lighting, to be emphasized; and it is this—that though the City of London was the pioneer in high-pressure gas lighting no less than eight years ago on the bridges over the Thames, and there have been adoptions of the system in main streets and open spaces at various times since then, Berlin has now the largest high-pressure installation in the world, and other Continental cities are tentatively following suit, although they have in the streets considerable installations of flame and other arc lamps. Berlin has already 25 miles of streets lighted by high-pressure gas-lamps; and, with the cost spread equally over seven years, at the rate of £50,000 a year, the Municipality are improving the street lighting by eliminating all the electric arc lamps, flame and otherwise, and the vertical incandescent gas-lamps, and substituting therefor high and low pressure inverted gas-lamps, in a systematic manner, according to the character of the streets.

The reason Berlin is doing this, the reason other cities with both gas and electricity in the streets (and the supply of both commodities mostly a matter of civic venture) are experimenting in the same direction, is the improvement of the inverted gas-burner for low pressures, and its successful adaptation for high pressures. Our electrical friends when criticizing the report would have their readers believe that the only reason the Municipality of Berlin are adopting gas lighting throughout their streets is that they themselves are the suppliers of gas. But we would ask the critics to bear in mind, before making too free with that point, that one-fifth of the street gas lighting is in the hands of a private concern (the Imperial Continental Gas Association), and that the Municipality, though not producers of electricity, purchase in bulk at a low price per unit from the private Company supplying in the city. However, the deputation in the matter of street illumination have taken Berlin as their exemplar—not in methods, but in the amount and the character of illumination, and the systematic application of the inverted gas-burner, under high and low gas pressures, to main streets, open spaces, and side streets, by graduating the power of the source of illumination to the circumstances of situation.

There are only three recommendations in the report; and the third one is the most important. It is:—

> That high-pressure incandescent gas-lamps, with inverted burners, should be adopted as the illuminant; but, where gas is impracticable, electricity, with open arc and flame arc lamps, should be installed.

Under such circumstance, if the Court of Common Council hereafter approve the report, electricity will take a very small part in the lighting of the City, because there is no place, or situation, in the streets where it is impracticable to supply gas. Our electrical friends are rejoicing over what they ignorantly believe to be a fact, that the first recommendation of the deputation will completely put high-pressure gas lighting out of court, and leave electricity as the sole possessor of the field under the condition laid down by Mr. Teuten and his colleagues. This is that "*wherever* "*possible*, streets *should be* lighted by means of centrally "hung lamps with lowering gear." The recommendation is wide and not imperative in its terms. Then the second of the resolutions is that "open spaces should be lighted by "means of lamps upon standards fitted with lowering gear." The reason the deputation consider central suspension important in the City of London is that the number of obstructions upon the footways in the form of lamp-posts, bins, letter-boxes, &c., is so large. The deputation therefore make this proposal not because they think a better lighting effect is procurable from central suspension, but to get rid of one form of obstruction on the footpaths, and leave the rest. We would suggest to them that it might be less costly and more practicable to move the "bins, letter-boxes, &c.," than the lamp-posts.

It is, however, for the Court of Common Council of the City to choose, and for the suppliers of gas to comply with the requirements of the Council. For, however much we may think that central suspension for either gas-lamps or electric arc lamps is not the correct thing for the proper distribution of light under all the conditions of road and footpath traffic, if the City authorities want centrally suspended gas-lamps they can have them, and without causing any obstruction in the streets. Our electrical friends gibe at the inverted mantle standing the travel of the lamp occasioned by the use of raising and lowering gear; but their knowledge of what an inverted mantle can stand is misty to the extreme.

They also chuckle over the central suspension and raising and lowering gear being applied to high-pressure gas-lamps. Raising and lowering gear has long since been applied to gas-lamps on standards; and it requires very little extension of the principle to enable the lamps to travel on a wire track to a central position over a road. As a matter of fact, the makers of the high-pressure inverted gas-lamps in Fleet Street are at the present moment at work on a device which will enable centrally suspended high-pressure lamps to be drawn to the side of the streets, and raised and lowered for cleaning without in any way incommoding traffic in the City or elsewhere, either by day or by night. There is no more difficulty in doing this than there is in supplying compressed air to travelling stoking machinery in gas-works retort-houses. On the other hand, the use of raising and lowering gear with electric wires would cause a great deal of wear and tear on those live wires; and an extensive adoption would necessitate, in the public safety, an expensive daily examination. There is central suspension of electric arcs in Cologne and Düsseldorf; but to reduce to a minimum the danger to the public from defective wires, there has, the deputation reports, to be a daily systematic inspection. In Vienna, there are only five centrally hung electric arc lamps; and up to the present there have been three cases in which the lamps have fallen owing to breakage of the wires. In Cannon Street in the City the lamps are fixtures; but they necessitate a trolley ladder for their trimming; so that they do not comply with the requirement of the deputation. What it would mean if the whole of the City lamps had to be dealt with in this way is beyond imagination.

The deputation do not appear to have inquired into the relative reliability and the relative penetrating power of incandescent gas-lamps and electric arc lamps; but these are most important points in view of London's dense traffic and fogs. In the particulars given in the report regarding Vienna, Brussels, Cologne, Düsseldorf, and Dresden, it is seen that the arc lamps are supplemented by incandescent gas-lamps, which are used after midnight, and, as stated in the reference to Cologne, "when the arc lights fail." Be it observed, in this connection, that in most of these cities both the electricity and gas supplies are under the care of the municipal authorities. Nevertheless, recourse is had to stand-by incandescent gas lighting in the streets. The arc lamps in Geneva are also fitted with incandescent gas-lamps; and very useful these were found last September. This is a matter worth noting by the City authorities. If in the streets where electricity is used, safety and efficiency necessitate a second system of lighting, then better is it to pick from the two the safer one; and the safer one happens in this case to be the more efficient. This being so, it is not difficult to select the one to which to adhere. A further consideration is that of cost. If the Gaslight and Coke Company's Bill goes through this session, there will be an additional reduction in the price of gas for public lighting; and this will mean that the annual cost of each of the 1500-candle power high-pressure inverted lamps in Fleet Street will be reduced from £16 10s. to £15 2s. 6d., as compared with the offer of £17 10s each for not less than 250 flame arc lamps such as are suspended in Cannon Street. "In future incandescent gas lighting only will be used in "Berlin;" in future, if the report goes through, there is no reason why anything but incandescent gas lighting should be used in the City of London. Mr. Teuten and his colleagues are to be congratulated on the manner in which they have carried out their mission; and for the practical views which have directed them in the preparation of their report.

A Durham Coal Test in the Glover-West Verticals.

The tests that were formerly made with the slacks of local coals in the ordinary working of the Glover-West continuously operating vertical retorts at St. Helens, while highly satisfactory in the improvement shown in results in comparison with those from the carbonization of the same class of coals in horizontal retorts on the works, were deficient for comparative purposes by gas engineers generally on the ground that the slacks and nuts used at St. Helens are little known outside the locality. The higher results, however, obtained from the vertical retorts with these coals were a sufficient guarantee that, using ordinary well-known gas coals, the system should give an excellent account of itself in superior results in contrast with horizontal working. The owners of the system have therefore done well in again placing the plant freely in Dr. Colman's hands, for a trial with a well-known Durham coal (Thornley), and on a scale that entirely removes from it any suspicion of "nursing" for the special purpose of the run. Under the charge and supervision of Dr. Colman, a strict impartiality, it goes without saying, would prevail throughout the operations.

It will be remarked from the account of the results of the test, as published elsewhere in this issue, that close upon 60 tons of Durham coal were carbonized; so that we may take it, the trial went on continuously for three days. The attested results of Dr. Colman's trial have given every satisfaction to Messrs. Glover and West, though only supplying the confirmation of what was anticipated. The average quantity of gas made per ton was 13,102 cubic feet; and the analysis of the gas indicates an excellent composition. In view of the high make, the fact that the percentage of nitrogen is only 3·2 will be a testimonial to both soundness of structure and efficiency of working, after nine months' continuous running. In view of the make, the illuminating power of 15·56 candles, and the net calorific power of 514·5 B.Th.U., will also meet with approval. The low fuel account previously commented upon—due to both the system of heating and the extraction of the heat from the coke in the bottom of the retort for the heating of the secondary air—is corroborated by the figures as to fuel in this run; only 12·3 per cent. of dry coke being used. The report on the test is very short, so that we will not review the whole of the data here. But there is one figure that will be noted by those troubled with a high sulphur content in their gas; and it is that the total sulphur in the gas purified with oxide only averages, in this trial, only 20·8 grains per 100 cubic feet.

We are pleased that this test with Durham coal has been made. It supplies precisely the information that was wanting in our descriptive article on June 8 regarding the system and working at St. Helens; and it will intensify the interest in the system that the previous publication in these columns evoked. Upon the results, with Dr. Colman's signature appended to them, Messrs. Glover and West are to be highly congratulated.

Asking for a Calorific Power Standard.

There must be obstinate resistance on the part of gas suppliers to any proposal for a calorific power standard for gas in every case in which the opponents of gas measures ask for one, unless it be in substitution for the illuminating power standard. That is the *sine quâ non* to any alteration of the conditions of supply. It was bound to follow upon the acceptance, for diplomatic reasons, by the Gaslight and Coke Company of such a standard, that local authorities should use the precedent for trying to obtain additional control over the gas companies supplying in their districts. The Gaslight and Coke Company precedent being new this session, the probability is that next session there will be many attempts to take advantage of it. But it should be clearly understood that Parliament itself did not introduce the standard of calorific power into the Bill of the premier Company; it was merely an agreed introduction forming part of a settlement with the London County Council and the City Corporation. When the Bill was before Mr. Mooney's Committee in the House of Commons, the Governor of the Company (Mr. Corbet Woodall) protested very decisively against the dual penalty test, which shows that it was forced upon the Company in the exigent circumstance of appeasing powerful opponents. The duality of standards is the strongest objection, and a secondary one is that a fair standard of calorific power under all conditions of manufacture has not yet been ascertained, though, after all is said on this point, it only requires time for every gas-works to determine what that fair standard would be.

The insertion in the Coatbridge Gas Order of a calorific power standard was asked for last week when the Confirmation Bill containing that measure was before the Duke of Devonshire's Committee; and then Mr. Corbet Woodall threw the whole weight of his authority against any such introduction by Parliament—particularly in the case of a small Company such as this, and while the illuminating power standard remains. Great care will have to be exercised, whenever the change comes about (as come about it will, so far as human foresight enables one to judge), that no more onerous conditions are imposed through the calorific power test than are applied in these days in connection with illuminating power. Mr. E. H. Stevenson seems to think that under any and all circumstances it is the easiest thing in the world to say what would be a fair calorific power standard. It is not in all cases. He is labouring under the delusion

that "the calorific value of a gas is well known when one "knows what is the illuminating power of the gas." Mr. Stevenson must revise his opinions in this respect. The old evidence and spotted diagrams that were a few years ago put before a Parliamentary Committee, showing an approximate relationship between calorific power and illuminating power have been knocked on the head by latter-day experience. If he believes his submission iscorrect, will Mr. Stevenson tell us how it is the 10 to 11 candle gas made in the Dessau vertical retorts, and the low illuminating grade gas made in the Munich chamber settings, have a close correspondence in calorific power with that of the 16-candle gas made in the horizontal retorts of the London Gas-Works? At the present stage, the question of a calorific power standard is too serious a matter for such random shots as that "the calorific power of the gas is well known when "one knows what is the illuminating power." However, the Duke of Devonshire's Committee saw the injustice of inflicting a test on the Coatbridge Gas Company supplementary to the one in existence. This is satisfactory; but the incident is, if we mistake not, the first indication of many a coming tussle.

The New Chief.

Successor to Sir George Livesey, Mr. Frank Livesey, and Mr. Charles Carpenter in the Chief Engineership of a Company with such historical associations as that of the South Metropolitan Gas Company is a position that many men in the gas industry might covet, but only one at a time can fill. The honour (as will be seen by the announcement elsewhere) has fallen on Mr. W. Doig Gibb, the Chief Engineer of the Newcastle and Gateshead Gas Company. Actually the duties of Chief Engineer have been continued by the Chairman of the Company (Mr. Charles Carpenter) since the higher dignity was conferred upon him; and, in the circumstances, there was no occasion for haste in appointing a successor. However, the position was bound to be filled sooner or later; and, without inviting applications for it, the Chairman has been looking round, and his personal inquiries have satisfied him that in Mr. Gibb he had found the right man. This view has been endorsed by the Board. The loss will be a great one for the Newcastle and Gateshead Gas Company; but the keenness of it will be lessened by the reflection and the gratification that in the honour of Mr. Gibb's new appointment (after his many years' service at Newcastle) the Company share. Their loss is the gain of the South Metropolitan Company; and in that Company Mr. Gibb will find a set of officers and thousands of workers who will give him loyal support, if only for the reason that their Chairman and the Board are satisfied that the new chief is the right man in the right place. It is the unexpected that has happened, because it was thought that Mr. Gibb was wedded to Newcastle by ties that could not be readily dissolved. On the other hand, the proffered position being so high placed in the professional sense, was not one that could be rejected without very good reason. Though the unexpected has happened, on the transition from Newcastle to London to the post of honour and of work, we cordially join in the welcome that will be extended to the new Chief Engineer by his friends down South.

A Ballot to be Taken.

At the close of a lengthy conference last week of the Miners' Federation of Great Britain—held for the purpose of considering the wages dispute in Scotland—it was announced that a decision had been come to that a ballot should be taken at once on the advisability of putting in force the famous "Rule 20." This rule, it may be repeated, is to the effect "that whenever any county federation or district is attacked on the wage question, all members connected with the Society shall tender a notice to terminate their contracts, if approved of by a conference called to consider the advisability of such joint action being taken." This is the rule which would form the basis of the "national strike." The decision arrived at has naturally been welcomed by the Scottish miners, from the point of view of "persuasion" of the owners, though really the result of the ballot cannot be made known until at least two days after the notices with which the men have been served are due to expire. Meanwhile, the question with which the English and Welsh miners are confronted is a serious one—there is no ambiguity about the way in which it is to be put on the ballot-papers: "Are you in favour of determining your contracts for employment so that you may stop in sympathy with the Scottish miners?" Pending the decision of the ballot, financial support amounting to 10s. per week per member is to be paid by the Federation to the Scottish miners should they fail to come to an agreement with the masters by the time the notices expire. Of such an agreement, however, there seems to be some hope, as the parties have provisionally accepted an offer by the President of the Board of Trade to intervene with the object of bringing about a settlement of the present dispute, and thus avoiding a strike or lock-out. In the meantime, as touching the question of the "national strike," it has been pointed out that the notices required for a strike vary in different districts. In some cases a week is necessary, in others a fortnight, and in South Wales a month. It is said to be the intention of the Federation, should it be decided to put Rule 20 into operation, to issue the notices so that the strike may begin on the same date throughout the country; and under these circumstances it will not be practicable to commence the strike much, if any, earlier than Sept. 1.

Lightning Effects.

Some curious lightning effects have been the subject of correspondence in the "Electrical Review." Mr. J. Swan, of Chesham, mentions a few cases in which people in his town have had a little life introduced into the ordinary run of their existence by being electricity consumers. Part of the Chesham district is supplied with bare overhead distributors on the negative side of the three-wire system. Eight houses are supplied with bare overhead services; and seven with underground services from the overhead distributor. One of the houses with the undergound service was recently struck by lightning, and the chimney and part of the roof were destroyed. Inside the house, a hanging pendant was burnt up; and the three-way distribution board, main fuses, and meter were completely destroyed. The experience was not an isolated one. In five houses within a quarter-mile radius, but supplied from the ordinary underground main, the flexible wire of pendants in various rooms was burned through, and circuit fuses blown; and in eight other houses supplied from the ordinary underground main, filaments of lamps were broken, and bits of the filaments were found sticking to the glass bulbs. In Mr. Swan's own house, about a mile away from the house that was struck, a flexible wire attached to a voltmeter was burned through, and a circuit fuse blown. In another instance, the flexible of a pendant, supplied with current from the positive side, was burned through, and the main fuses blown. Then Mr. F. M. Long, of Norwich, (whom the members of the Institution of Gas Engineers had the pleasure of meeting last month) mentions that, during a severe storm which occurred about a month ago, between 40 and 50 lamps in different houses, scattered over a considerable area in Norwich had their filaments broken. These lamps in nearly all cases were in bedrooms, and were not alight at the time. Pieces of the filament were stuck to the side of the glass, as noticed by Mr. Swan. These are interesting occurrences; and they show that electricity consumers can, without extra payment (other than that required to repair the mischief), enjoy some delightful phenomena, in addition to sudden fires and light extinctions without warning.

Trade Unions and Politics.

The question of the miners' parliamentary levy was before the Chancery Division of the High Court of Justice some days ago, when an injunction was granted against the South Wales Miners' Federation restraining them from raising or enforcing against the plaintiff, or any other member unwilling to pay the same, any levy for providing funds to pay the expenses of returning and maintaining parliamentary and other public representatives. In 1901, the Federation made an addition to their rules, the affect of which was to state that one of the objects of the organization was "to provide funds wherewith to pay the expenses of returning, and maintaining, representatives to Parliament and other public councils and boards, and to request them to press forward by every legitimate means all proposals conducive to the general welfare of members of the Federation." The action was brought by a miner, of Conservative opinions, to secure a declaration that this rule was illegal, and that the raising of levies thereunder from the plaintiff and other members, and the distribution

of moneys for the purposes and in the manner appearing therein was not within the objects of the Federation. The year after the addition referred to had been made to the rules, the members decided by ballot that a levy of 1s. a year should be made under it. The plaintiff paid, because he was told that, if he refused, his share of the levy would be satisfied out of the next ordinary contribution paid by him. Besides this, members falling in arrears with the payment of the levy were placed under certain disabilities, which in a sense compelled compliance. There was, of course, practically no defence to the action, as in a railway case the Court of Appeal have already decided that such a rule is illegal. It was, however, suggested that the injunction should not be made in such terms as would prevent the levy contributed by willing members from being applied as indicated by the rule. There are four Members of Parliament supported by the Federation; and Counsel remarked that "it would be highly inconvenient if their salaries could not be paid." The injunction was granted in the terms asked for by plaintiff. But, with his consent, a qualification was made, so as not to prevent the defendants from applying any sum, part of the amount levied, "and not exceeding in the whole £1000," for the purpose of paying the salaries of the four members of Parliament to the end of the present year. The object of this, doubtless, is to bridge-over the time that must intervene before the House of Lords can give a decision in the other case, which is being taken to them from the Court of Appeal. It is a judgment which should to some extent satisfy both sides; but it will be much better from all points of view when the law of the land on the subject is definitely settled. If the ultimate decision should be against the Trade Union organizations, it should certainly be possible to find some better means of providing for the support of the labour members than by exacting levies from men who may not agree with the opinions these members are sent to Parliament to voice.

North British Association of Gas Managers.

The Forty-Eighth Annual General Meeting of the Association will be held in Stirling on the 29th and 30th inst. The business, which will be transacted in the Albert Hall on the former day, under the presidency of Mr. James D. Smith, the Engineer and Manager of the Stirling Gas Company, will comprise the reception of the Committee's and Auditor's reports and the statement of accounts, the delivery of the President's Inaugural Address, and the reading and discussion of papers. Of these, there will be three—viz., "The Installation of Carburetted Water Gas at Aberdeen," by Mr. Samuel Milne; "The Working Efficiency of High-Pressure Gas Plant at Dunfermline," by Mr. Alexander Waddell; and "The Latest Practice in Horizontal Retort-Settings at Falkirk," by Mr. William Wilson. The annual dinner will be held in the Golden Lion Hotel in the afternoon; and in the evening there will be a reception in the hotel, on the invitation of the Directors of the Stirling Gas Company. Next day there will be an excursion by motor conveyances to Callander; the route to be taken—viz., by Dunblane, Crieff, Comrie, St. Fillans, and Lochearnhead—being famous for its magnificent scenery. Dinner will be served in the Dreadnought Hotel; and in the afternoon the return journey to Stirling will be made *viâ* Doune.

Next Year's City and Guilds Examinations.

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) the programme for the ensuing session, containing the regulations for the examination of candidates in technological subjects. As is customary, examinations will be held in the two subjects of "Gas Engineering" and "Gas Supply;" and intending candidates will find on pp. 53-8 an indication of the nature of the questions which will be set by the Examiners (Mr. W. Doig Gibb and Mr. J. H. Brearley) in the Honours and Ordinary Grades, and a list of the books they are recommended to consult. The examinations will be held on the 16th and 23rd of April next. The first prize in the Honours Grade is £3, given by the Goldsmiths' Company, and the Institute's silver medal; the first and second prizes in the Ordinary Grade being £2 and £1 10s., given by the Company (in each case accompanied by the Institute's bronze medal); and the third a bronze medal. The examinations in "Coal-Tar Distillation and Coal-Tar Products," particulars in regard to which will be found on pp. 42-6, will be held on the 21st of April; the Examiner being Dr. J. C. Cain. In the Honours Grade, the first prize is £2, given by the Salters' Company, and the Institute's silver medal; the first and second prizes in the Ordinary Grade being £1 10s. and £1 (with the Institute's bronze medals); and the third a bronze medal. The programme is published by Mr. John Murray, Albemarle Street, at the price of 9d. net.

It is announced that Mr. H. W. Pugh has resigned his seat on the Board of the British Coalite Company, Limited.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 205.)

There was no improvement last week in the general current of affairs on the Stock Exchange, and business continued most disappointingly slack and dull. The vast number of new issues brought out seems chiefly to blame for this state of things. People will run after novelties; and the consequence is that the old lines get neglected, especially the choicest gilt-edged class. Thus business was at a very low level, except that the settlement of the fortnightly account provided plenty of occupation. The general outlook was fair at the opening on Monday; but later on it fell away, and prices crumbled—Consols losing $\frac{3}{16}$. Business continued listless and idle on Tuesday. There was not much change in values in the high-class issues; but in the more speculative Mining and African, there was weakness. The features of Wednesday were much the same; and, moreover, the weakness extended to Consols and the gilt-edged division. On Thursday, dullness was the prevalent characteristic; and fears regarding coal badly depressed Railways. Consols, however, picked up a little; and there was some brightness in the Foreign Market. Friday was a very quiet and dull day. There was a good bit of selling, and several markets were lower; but Railways took a hopeful view of the coal question. Things remained much the same on Saturday, with Railways in better heart; but Consols were a little lower. In the Money Market, the supply continued in the same plenty as of late; and rates ruled very easy accordingly. Discount terms hardened up to a point, but gave way again before the close. Business in the Gas Market showed an increase in volume, which was largely indebted to operations in Argentine issues in view of an amalgamation of undertakings. In Gaslight and Coke, the ordinary was pretty active and strong. Transactions ranged from $103\frac{1}{4}$ to $104\frac{1}{4}$; the latter figure being repeatedly marked (a rise of $\frac{1}{2}$). In the secured issues, the maximum was done at 89 and $89\frac{1}{4}$, the preference at 106 (a rise of 1), and the debenture at from $85\frac{1}{2}$ to $86\frac{1}{2}$ (a rise of $\frac{1}{2}$). South Metropolitan was quiet and unchanged, with dealings between 122 and $123\frac{1}{2}$. The debenture was done at $86\frac{1}{2}$ *cum div.* Commercials were quiet. The 4 per cent. changed hands at $108\frac{1}{2}$ and $108\frac{3}{4}$, the debenture at 82. In the Suburban and Provincial group, Brentford old was done at $256\frac{1}{2}$ (a fall of 1), ditto new at 197 (a rise of 1), ditto debenture at $100\frac{1}{2}$, Brighton "A" from $155\frac{1}{4}$ to 156, British at $43\frac{3}{8}$, Ilford "B" at 108, South Suburban preference at $122\frac{1}{2}$ and 123, Tottenham "A" at 133 and $133\frac{3}{4}$, and West Ham at $122\frac{1}{2}$. Other issues had improvements, as shown in the list, p. 205. In the Continental companies, Imperial was unchanged at from 179 to $180\frac{1}{4}$, ditto debenture marked $96\frac{7}{8}$, Union 97, ditto preference 138 and $138\frac{1}{2}$, European fully-paid $25\frac{1}{4}$ *cum div.* and $24\frac{5}{8}$ *ex div.*, ditto part paid $18\frac{5}{8}$ *ex div.*, Tuscan $9\frac{5}{16}$, ditto debenture $100\frac{1}{2}$ and 101. Among the undertakings of the remoter world, Buenos Ayres changed hands at $13\frac{3}{4}$ and $13\frac{15}{16}$, Primitiva at $6\frac{13}{16}$ and $6\frac{15}{16}$, ditto preference at $5\frac{3}{8}$ to $5\frac{17}{32}$, and River Plate was very active at $14\frac{7}{8}$ to $16\frac{1}{8}$ (a rise of 1).

ELECTRICITY SUPPLY MEMORANDA.

A Council Chamber, Vitiated Atmosphere, and Aching Heads—Metallic Filaments and Loss in Consumption—An Illuminating Engineer's Estimates—From Fiction to Practical Illustration—Some Loose Assertions.

The question of the relative merits of gas and electricity in maintaining the atmosphere of rooms and other enclosed places in wholesome condition, is one that is often brought forward in electrical literature, and then all that, and more than, can be truthfully asserted derogatory to gas is said with much garnishing, and all that can be said favourable to electricity is boldly put forward, but all that can be said that is unfavourable is safely concealed. If we are not mistaken, the Council Chamber of Bristol is electrically lighted. The Law Courts and the New Central Criminal Court in London are similarly illuminated; and there have been unmistakable complaints about the ventilation in these buildings. So there have been about the Council Chamber at Bristol; and the Council are electricity suppliers, and have that stalwart among Electricity Committee Chairmen, Alderman Pearson, at the head of the department. But, still, electric lighting notwithstanding, there has been much trouble over the ventilation of the Chamber among the councillors who are compelled to spend hours at a stretch in it, though an electric fan is used, the buzzing of which is also a ground for grievance. There was a discussion over a ventilation scheme at the last meeting of the Council—a scheme providing for fresh-air inlets and bad-air outlets, together with an electric "Sirocco" fan—the cost of which scheme will amount to no less than £309 10s. A few excerpts from the discussion are useful testimonials. At present, says one member, the atmosphere becomes heated. Another declares that "the councillors get into a condition in which they are not able properly to carry out the business of the Council." Another refers to a "vitiated atmosphere." A further member alleges that "he is never over two hours in the Council Chamber without getting a bad headache." Dr. Bevis expressed the opinion that "the proposed expenditure on ventilation would be recouped by extra lucidity of thought and thinking in oxygen instead of in carbonic acid." Fancy councillors getting into a

comatose state, and suffering headache, through sitting in a vitiated electric lighted atmosphere in which the proportion of carbonic acid is as high as inferred by Dr. Bevis. We should like to see the effects of this condition of things illustrated on highly coloured mural cartoons, such as are recommended by our electrical contemporaries, and posted up broadcast, as recently were some libellous ones, of which any self-respecting electricity vendor would have been downright ashamed. They are now disappearing from bill-posting stations, having completely failed in their purpose.

While speaking of Bristol, allusion may be made to a rather heated debate on the electricity accounts at the last meeting. Many of the members are dissatisfied with them, because despite Alderman Pearson's picturesque explanations and rash predictions, the undertaking is incorrigible, and absolutely refuses to ascend to a level at which there will be a little profit for the ratepayers. The two last years the gross profit has been about equal—£43,126 in 1907-8 and £43,164 in 1908-9—and the net loss last year was £305. The fact that the gross figures have kept about on a level in this manner must be due to economies in works and in other expenditure, seeing that the decrease in the receipts for private lighting was last year £4030, which is alleged to have been brought about chiefly by reason of the metallic filament lamps, while the power output only increased by £1600. About the marvellous consumption reducing power of metallic filament lamps, Alderman Pearson picked out a few consumers whose accounts have dropped by an average of 53·8 per cent. through the displacement of carbon filaments by metallic filaments; while, according to the Electrical Engineer (Mr. Faraday Proctor), the latter only consume one-third of the electricity of the former. Now we suggest that the consumers' accounts Alderman Pearson quoted should have shown a reduction of about 66 per cent., instead of only 53·8 per cent., in view of the two-thirds reduction spoken to by the Engineer. If, by the adoption of these lamps, the consumption actually falls off by two-thirds, then there ought to be shown, in view of the extent of adoption in substitution of carbon filament lamps, a greater fall in the revenue of the department. We have examined several accounts of metallic lamp users who previously employed carbon filaments, which accounts do not show anything like a 53 per cent. reduction. More illumination is obtained, but accounts for consumption with ordinary usage of lamps do not as a rule—there may be a few that can be picked out for advertising purposes—exhibit the (as our friends at West Ham would describe it) theoretical saving.

Mr. Haydn Harrison, we believe, belongs to the new school of illuminating engineers, whose guiding motto is "Be just, and fear not." An illuminating engineer is a person who is supposed to be capable of advising people on all systems of illumination in a most impartial manner. Mr. Harrison shows in an article in the "Electrical Times" how, in an independent, unbiassed way, he would set about the work. He would assume that an incandescent gas-burner gives only 10 to 15 candles per cubic foot of gas consumed, instead of the 18 candles that Mr. James Swiuburne accorded the common vertical incandescent burner several years since. He would ignore all the improvements effected since Mr. Swinburne's investigations permitted him to make his proclamation on this point. The inverted burner does not count with Mr. Harrison, with its 20 to 25 candles per cubic foot of gas, according to quality. For an ordinary 50-candle gas-burner, the virtuous Mr. Harrison would take a consumption of 4 cubic feet; thus allowing an efficiency of only 12½ candles per cubic foot, and he would add to this the high consumption for a bye-pass of ¼ cubic foot per hour, eschewing the fact that the pilot—except in inaccessible places, and where pressure lighting and extinguishing is in vogue in the streets—has been dropped; and then he would take the mantle renewals at 2s. per burner per year. By the aid of these distortions of fact, he arrives, for a 500 hours' use of a single 50-candle burner, with gas at 2s. 6d., at the following:

Gas consumed in burner, 2000 cubic feet . .	5s. od.
Gas consumed in bye-pass, 1500 ,, . . .	3 9
Mantle renewals	2 0
	10s. 9d.

We have the privilege of pointing out to Mr. Harrison something that he manifestly does not know—that, with 2½ cubic feet of gas per hour, a light of 50 caudles can be easily maintained, using a regulated inverted burner of the modern type. By the assistance of such a burner, we get down to a consumption of 1500 cubic feet in 500 hours, which is equal, at 2s. 6d. per 1000 cubic feet, to 3s. 9d.; and if we discard the bye-pass, and add the extravagant consumption of a pennyworth of matches, this will make 3s. 10d. Then setting aside the ridiculous estimate of 2s. for mantles for 500 hours for a single burner, and reckoning one inverted mantle at 4½d., this will make a total of 4s. 2½d. per burner per 500 hours to set against Mr. Harrison's own calculations for electricity (4d. per unit) as follows:

Electricity (*Low Voltage*, 100).

Units consumed (55 w. × 500) 27·5	9s. 2d.
Lamp renewals	1 0
	10s. 2d.

Electricity (*High Voltage*).

Units consumed (63 w. × 500) 31·5	10s. 6d.
Lamp renewals	1 4
	11s. 10d.

We will ask Mr. Harrison to descend from fiction to reality, and take the case of a twelve-roomed house, the gas accounts for which he is quite at liberty to inspect. There are 27 incandescent burners in the house, a large size domestic gas cooking-stove, and three gas-fires. The burners are mostly of the inverted type. The people are wasteful in this house. They love a light house at night time, and to be able to get about it with freedom, and without groping about the wall for switches. It is not an infrequent occurrence to find half-a-dozen rooms in this house, and in addition the hall and landing, lit up at the same time, and remaining so until about eleven o'clock. From Jan. 1 to Dec. 31—morning, noon, and evening—cooking is done, and all the hot-water required (except for the bath) is obtained, by the gas-cooker or boiling-rings. No check is kept on the use of the cooker. The three gas-fires are used in winter as needed—one of them every morning and evening in a bedroom. The gas account for all this light, fuel for heating, cooking, and hot-water, and for convenience and comfort in this twelve-roomed house only comes to about £12 a year—less than £2 10s. each summer quarter, and about £3 10s. each winter quarter. The mantles purchased during the past twelve months for the whole of the burners (not one of which has a bye-pass) only amounted to two dozen; and some of them are still in stock. If Mr. Harrison is right in his calculations per burner, the lighting of this house alone (without a twelve months' cooking and water boiling, and heating as required in three rooms), ought to work out to much more than the total gas account. If Mr. Harrison is a gentleman whose calculations are to be relied upon, it is grossly impertinent on the part of the gas company to treat their consumers as though they stood in need of charity, and not to charge more. The mantle consumption, too, for these 27 burners, ought to come out at £2 14s. per annum. The burners ought to be ashamed of themselves for not requiring in the past twelve months more than 5s. to 6s. worth of mantles in the total (deducting from the two dozen bought those not yet used). We hope there are not many more members of the band of illuminating engineers guilty of such absurdities and prejudice as is Mr. Harrison in his article in the "Electrical Times."

It is a matter both of interest and regret to notice how loosely the responsible officers—medical officers, borough surveyors, and others—and members of committees of some of our public authorities make assertions regarding the relative costs of electric lighting and incandescent gas lighting, and how frugal they are in giving details relative to those assertions. The fewer the details afforded, of course, the less scope is there for criticism; and officers and committeemen are fully aware of this—that is to say, assuming they have themselves sufficient knowledge upon which to make a comprehensive estimate. Some of them unfortunately have not, though they would pose before the members of the local authorities as being perfect experts at the work. Local authorities should have a care, and ensure, by hearing both sides, that they are being well and properly advised. It is feared that, in this matter, some local authorities attend to their business in a very perfunctory sort of way. Just listen to this meagre information. The Gosport Urban District Council have decided to give the Gosport Gas Company six months' notice to terminate the agreement for street lighting, and then to ask for fresh terms. A Mr. Harvey has told the Council that the cost of gas at 3s. per 1000 cubic feet works out per lamp per year to £2 12s. 6d., *plus* £1 for labour and maintenance. But "electric light" [*sic*] at 2½d. per unit would be £3 per lamp, or 12s. 6d. cheaper than gas. Now what does that £3 include? If the electric lamps are running the same number of hours as the gas-lamps, and giving the same illuminating power, and the gas-lamps are of a modern type, then we say that, at 3s. for gas and 2½d. for electricity, with maintenance and all expenses added, the electric lamps cannot be run so cheaply as gas. Again, we see that Dr. Lock, the Medical Officer to the Uxbridge Guardians, has written to the Board urging them to consider the advisability of substituting electricity for gas in the workhouse. In an airy sort of way, the Medical Officer remarks that "electricity is healthier, cleaner, safer, and more economical." From the report before us, it does not appear that Dr. Lock put himself to any trouble to tell the Guardians the grounds for his statements. It is perhaps sufficient from Dr. Lock's point of view that Dr. Lock has spoken. If he would vouchsafe the Guardians some particulars, or send them on to us direct, there would be an opportunity of discussing the matter with him. The Doctor also tells the Guardians that their "gas bill for the last twelve months was £161 9s. 8d.—more than double the electric light bill, while the number of lights by each system is *probably* nearly the same." Was the number of lamps really the same, was the illuminating power the same, was the number of hours' use the same, and were the gas-lamps of the modern kind, which are both economical and highly efficient? Then Barnstaple workhouse is lit by oil-lamps. To instal gas would cost, it is said, from £63 to £95; while for electricity an outlay of from £125 to £152 would be incurred. A Mr. Radford has told the Guardians that electricity (on the basis of lighting Taunton and Exeter workhouses respectively) would cost 8s. 2d. for each electric lamp per annum and 8s. 5½d. for gas. What are the details of these costs—prices, including maintenance, hours of use, illuminating power, and so forth? Mr. Radford is satisfied that, if electricity is adopted, it would prove cheapest, most convenient, and safest. Now if Mr. Radford will be so good as to tell us more about the grounds for his satisfaction, we shall have much pleasure in entering into the subject with him a little further.

SOUTH METROPOLITAN CHIEF ENGINEERSHIP.

Appointment of Mr. W. Doig Gibb.

The selection of Mr. Charles Carpenter to fill the position occupied by the late Sir George Livesey as Chairman of the South Metropolitan Gas Company prospectively created a vacancy in the engineering department. This has now been filled; and we are pleased to learn that Mr. W. Doig Gibb, the Chief Engineer of the Newcastle-upon-Tyne and Gateshead Gas Company, is to be Mr. Carpenter's successor. The appointment is the outcome of a visit paid by Mr. Carpenter to the northern Company's works, in order to confirm his impression as to their Engineer's suitability for the position it was proposed to offer to him; and he returned so satisfied with Mr. Gibb's qualifications in both essentials of character and ability, that he recommended his engagement to the Board of Directors. The choice was unanimously approved; and the new Chief Engineer will enter upon his duties at the beginning of October.

Mr. Doig Gibb is a son of Mr. J. S. Gibb, the Treasurer to the Edinburgh and Leith Gas Commissioners. He was educated at George Watson's College, Edinburgh; and, after having spent five years in the shops, he went into the drawing offices of what is now the Barrowfield Iron-Works, Limited, of Glasgow, where he served a four-years apprenticeship. The succeeding two years were passed in the Leith Gas-Works, which were at that time in charge of the late Mr. F. T. C. Linton. In 1892, he entered the service of the Newcastle and Gateshead Gas Company; his first position being that of Assistant-Manager of their Redheugh station. From this he was promoted in 1894 to the management of the Elswick works. He co-operated with the late Mr. V. Wyatt, the Engineer of the Company, in their engineering work generally; and he has for the last few years filled the position he will now shortly relinquish. Mr. Gibb is a thoroughly practical engineer, and has great faith in the training which young men get in the shops. He says he has never regretted the five years he spent there; for the information he acquired has been most valuable to him. At the same time, he has not neglected the training given by the schools, for he is the holder of many certificates, prizes, and medals. He was therefore singularly well qualified to undertake the duties devolving upon him as the Examiner in "Gas Engineering" for the City and Guilds of London Institute. As may be remembered, his paper on "Structural Engineering," read before the Institution of Gas Engineers in 1905, gained for him the silver medal; and he was President in 1907-8.

Apart from his qualifications as an engineer, Mr. Gibb possesses others which render him specially fitted to hold the Chief Engineership in a Company in which the outstanding features are co-operation and co-partnership. We have reason to know that the severance of Mr. Gibb's connection with those who are now associated with him in subordinate capacities will be witnessed with keen regret; for the news that they will shortly lose their chief has evoked expressions of feeling which have caused him to realize more than ever before the good relations subsisting between them. In his new sphere, working among employees trained under the large-hearted man whose regrettable death has brought about the present change, we are sure he will find an army of capable and willing helpers. His new position will necessarily entail heavy responsibilities; but we fully believe he will be equal to them. We congratulate him heartily upon having secured it, the more so because we understand the credentials to which consideration was mainly given were his honesty of purpose and his painstaking ability. Mr. Gibb is in the prime of life (being only forty-three); and we sincerely trust he may long enjoy the well-merited honour bestowed upon him by his appointment.

A GAS EXHIBIT AT THE WHITE CITY.

In addition to the high-pressure gas lighting and the several instances of the application of gas to power, cooking, &c., gas is after all to have a small representative display of its domestic uses through the enterprise of the Gaslight and Coke Company. Replying to an inquiry as to the accuracy of a rumour to this effect, the General Manager of the Company (Mr. D. Milne Watson) informs us that, about the end of April the Company were approached by the Coal Smoke Abatement Society with a request that they should join with them in fitting up a week-end bungalow, to be erected by the Alnwick Foundry and Engineering Company, for the Society, for the purpose of illustrating how a cottage can be smokelessly heated and lighted. The Company agreed to co-operate by fitting up the rooms with the most modern fittings for gas lighting, and the installation of gas-fires, gas-cookers, and a hot-water circulator; and, in the living room, a dog grate suitable for the burning of "Carbo"—the Company's smokeless fuel—or gas as may be decided by the Company. No coal fires whatever will be used. The bungalow covers a space of 1170 square feet.

Mr. Frank Priestman Lees, the eldest son of Mr. Herbert Lees, of Hexham, has been appointed to the position of Works Chemist at Preston, on the terms of the advertisement which appeared in the "Journal" a few weeks ago.

OBITUARY.

GEORGE KEYTE.

The Workington Corporation have lost a valuable servant, and the community of gas engineers a talented member, by the death of Mr. George Keyte, Gas Engineer and Manager, which took place at the Workington Infirmary last Tuesday night. Mr. Keyte was at his work so recently as the previous Saturday, and was removed to the Infirmary on the Monday night to undergo an immediate operation for appendicitis. He was the son of a Royal Engineer, and was born at Gibraltar, but reared at Ramsgate, where his father now resides. Until his appointment at Workington, in February, 1901, deceased was Superintendent of the Central Gas-Works, South Shields, to which town his widow belongs. His management of the Workington Gas-Works was distinguished by conspicuous ability and thorough up-to-dateness. Mr. Keyte, who was 37 years of age, and of an extremely affable disposition, was much respected by all who had the privilege of his acquaintance; while his subordinates' feelings towards him were cordial to the point of affection. The news of his death caused a painful shock throughout the borough; and the deepest sympathy of the inhabitants generally goes out to Mrs. Keyte in her loneliness and sorrow.

The funeral took place on Friday, and was attended by a number of gas managers and others. Mr. Herbert Lees, of Hexham, was present, as representative of the Committee of the North of England Gas Managers' Association, of which Mr. Keyte had been a member during the past two years; and other members of the Association present were Messrs. E. Shaul, of Penrith, J. H. Studholme, of Whitehaven, and J. R. Boadle, the Assistant at Workington. Other gas managers present included Messrs. Morris, of Maryport, T. H. Rich, of Millom, and A. Heywood, of Seascale. Mr. A. F. Young, of Cockermouth, was represented by his Assistant, Mr. Norman S. Mitchell. Mr. S. Studholme, former Manager at Whitehaven, was present, as well as Mr. Harold Baker, of High Wycombe, an intimate friend of Mr. Keyte's. The North of England Association also sent a wreath.

The "Whitehaven News," in their notice of the sad event, said: At Workington, Mr. Keyte succeeded Mr. Johnston as Gas Manager at a period of great depression in the gas-works. Owing to there being a dearth of coal caused by the strike of the miners, the Gas Committee were paying 25s. a ton for coal. Mr. Keyte at once set about the onerous work of rectifying the manufacturing plant in the Stanley Street works—concentrating his scientific knowledge and practical experience on the task; and the results proved most satisfactory. From thence onwards, his management of the gas-works was very successful. At the end of each financial year his ability, enterprise, and strict performance of his duties were testified to by the Chairman of the Gas Committee and the Council generally. That the price of gas was lowered to the consumers was principally due to Mr. Keyte's careful manipulation of the gas department, both in the production and the distribution of gas and the manufacture of bye-products.

Mr. James Johnston, the Chairman of the Stirling Gas Company, died of heart trouble on the morning of Sunday the 11th inst. He had been in feeble health for a considerable time.

We regret to learn, through the "Journal für Gasbeleuchtung," of the sudden death on the 5th inst. of Herr Burgmann, the Manager of the municipal gas, water, and electricity works of Altona. Deceased was widely known among, and greatly esteemed by, his *confrères* on the Continent.

Gaslight and Coke Company's Dividend.

We are informed by the Secretary of the Gaslight and Coke Company (Mr. H. Rayner) that the accounts for the past half year show that (subject to audit) the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 13s. 4d. per cent. per annum, carrying forward a sum of £409,893 4s. 4d. This compares with a dividend at the rate of £4 10s. 8d. per cent. per annum for the June half of last year, with a balance of £412,298.

Sir J. C. R. Colomb, one of the Directors of the Commercial Gas Company, whose death was announced in the "Journal" for the 1st ult., left £72,026.

Readers of the "Journal" are aware that Holland claims for Minckelers the right to be called the discoverer of coal gas; and, according to a paragraph in the current number of the "Engineer," recent researches of M. Boghaert Vache have established this. It seems to have come about in this way: The Duke of Arenberg, who was an enthusiastic balloonist, requested three professors of the University of Louvain to find a gas lighter than hot air and less costly than hydrogen. Professor Minckelers was one of the scientists employed, and he had the good fortune to extract the gas wanted from coal. In the middle of November, 1783, the first balloon inflated by coal gas ascended from the park of the Castle of Arenberg, at Heverle, near Louvain. This important event has just been commemorated by the commune of Heverle by a balloon festival under the auspices of the Belgian Aëro Club.

GLOVER-WEST VERTICALS AT ST. HELENS.

A Test with Durham Coal.

Reverting to the description of the Glover and West vertical retorts at St. Helens (see "Journal" June 8, pp. 632 to 638) and the accompanying tests made with the cheap local slacks of the district, all of which went to show that excellent results were being obtained, it was indicated at the time that further tests were in contemplation with well-known coals, from which it was anticipated that proportionately good results would be secured.

A test has recently been made by Dr. H. G. Colman, of London, with a well-known Durham coal (Thornley); and detailed results of his test are appended. It will be noted that the anticipations of the patentees have been more than realized, and it has been conclusively proved that the system can be operated as successfully with coals which give a large yield of gas per ton as with the local coals regularly used at St. Helens, which are not so rich in gas-making qualities.

The installation has now been in operation continuously for the past nine months, and during the last few weeks has been visited by a number of engineers of gas undertakings in the immediate district, all of whom have been much impressed by the smoothness and regularity of working and completeness of the installation.

DR. COLMAN'S TEST WITH THORNLEY COAL.

Coal Carbonized.—An average sample of the Thornley (unscreened) coal, taken from the trucks as used, gave the following figures of analysis:—

Moisture	1·08 per cent.
Ash	3·24 "
Total quantity of coal carbonized	59·75 tons
Total gas made, corrected to 60° Fahr. and 30 inches bar.	782,903 cub. ft.
Gas made per ton of coal carbonized	13,102 "

Quality of Gas.—Average samples of the gas made were collected in a holder of about 1000 cubic feet capacity, the period of collection being, as a rule, eleven hours. These were tested for illuminating power and calorific power with the following results:—

Average illuminating power with No. 2 "Metropolitan" burner	15·56 candles
Calorific value—	
Average B.Th.U. gross	573·6
" " net	514·5

Composition of Gas.—Samples were subjected to complete analysis, and gave the following average:—

Carbonic acid	1·00
Unsaturated hydrocarbons	2·85
Oxygen	0·05
Carbonic oxide	8·70
Methane	29·05
Hydrogen	54·70
Nitrogen	3·20
	99·55

Production of Coke.—The total yield of coke, weighed moist as discharged from the retorts, was 46·7 tons, an average sample of which gave on analysis—

	Per Cent.
Moisture	9·5
Ash	4·8

	Per Ton.
Therefore, yield of coke, moist as weighed	= 15·6 cwt.
" yield of dry coke	= 14·2 "

Quality of Coke.—This was of excellent quality, being bright and hard, and for the most part large. A test made with the discharge obtained in an hour showed that over 91 per cent. failed to pass through a 1½-inch fork.

Generator Fuel.—The total weight of moist coke used during the test amounted to 8·13 tons, or equal to

13·6 per cent. of moist coke.
12·3 " " dry coke.

Yield of Tar.—The total production of tar free from liquor was 795 gallons—

= 12·3 gallons per ton.

Quality of Tar.—The tar obtained was rather more viscous than that obtained from the Orrell nuts, but was still a relatively thin tar. On analysis, the following figures were obtained:—

Specific gravity, at 60° Fahr., 1·119.

Composition by Distillation, &c.

	Per Cent. by Volume.	Per Cent. by Weight.
Light oils up to 170° C.	4·7	3·7
Middle oils, 170° to 270° C.	23·2	20·2
Heavy oils, 270° to 350° C.	24·5	23·1
Pitch above 350° C.	—	52·6
Naphthalene	—	4·8
"Free carbon"	—	4·2

Yield of Ammonia.—The total yield of ammonia, calculated as 10-oz. liquor, amounted to 1892 gallons—

= 31·7 gallons of 10-oz. liquor per ton
= 26·7 lbs. of sulphate of ammonia per ton.

Yield of Cyanide.—A test of the gas made at the inlet of the washer showed the following:—

Cryst. sod. ferrocyanide = 4·1 lbs. per 10,000 cub. ft.
$Na_4FeCy_6, 10H_2O$ = 5·3 lbs. per ton.

Total Sulphur in gas purified with oxide only—
= 20·8 grains per 100 cubic feet.

Naphthalene in purified gas—
= 2·7 grains per 100 cubic feet.

NOTES FROM WESTMINSTER.

Gaslight Bill Passed by the Lords.

The Gaslight and Coke Company's Bill was reached yesterday morning by the Lords Committee to whom it was referred; but before the midday adjournment they had practically disposed of it. The West Ham Corporation asked for several concessions beyond those obtained in the House of Commons; but their principal attack was upon the clause in which the Gas Company, submitting to the desire of the Corporation to be assured that the works in West Ham would not be closed down for a period, consented to substantially continue the works as before the introduction of the measure for a full decade. The Corporation were not satisfied; like Oliver Twist, they wanted more. They wanted the time for the definite continuation of the works prolonged from ten to twenty years; they wanted the Company bound in respect of the extent of labour employed. But they wanted unreasonably and in vain. The Lords Committee evidently felt the Corporation had been already handsomely dealt with; for they passed the preamble of the Bill precisely as it stood. Clauses were discussed yesterday afternoon; but the Committee refused the main amendments of the Corporation—leaving others of a drafting character to be considered between the parties.

Reinstatement of Roads.

Promoters of Gas and Water Bills in Parliament frequently find themselves at variance with the road authorities over the protective clauses that the latter desire to be inserted in measures in regard to the disturbance and reinstatement of road surfaces in connection with pipe-laying. There are some County Councils with stereotyped sets of clauses to which real objection cannot be taken; but there are other road authorities whose responsible technical officers have fads and fancies that bring upon the users of subsoil onerous and unnecessary burdens. The threat of opposition if these clauses are not accepted is often sufficient to cause promoters to reluctantly give way; but sometimes we think it would be better if they carried their reluctance to the point of positive refusal. The expense of a fight is calculated to make promoters think seriously before deciding to meet a public authority with the ratepayers' money at their back; but resistance to unreasonable requirements on the part of a few companies might make the authorities moderate their conditions. The Llynvi Valley Gas Company is only a small concern; but the Glamorgan County Council, who threatened them with opposition if there was not acceptance of a clause in their Order that they considered objectionable, have had to bow to the Company—a House of Lords Committee having relieved the latter of the clause which the Council desired should be incorporated, though the Board of Trade had notified the latter that they could not see their way to require its insertion.

Unreasonable Demands.

In their efforts to get as much advantage as possible out of gas companies supplying within their areas of jurisdiction, local authorities often step beyond the bounds of reason. An illustration of this was seen in connection with the Coatbridge Gas Order last week, when the Confirmation Bill incorporating it was before the Duke of Devonshire's Committee. The Company were asking that the standard illuminating power of their gas should be reduced. At present they are under the obligation to supply a 20-candle gas tested by the union-jet burner—both quality and test being opposed to present-day scientific modes of using gas. The Company now work under the low standard price of 2s. 6d.; but the Council, in view of the reduction of illuminating power, desired to have this already low standard brought down to 2s. 2d. To have reduced it would have been most unfair. There is too much selfishness about local authorities. They seem to think that, in connection with every change, gas companies should be skinned of all advantage—that every particle should go to the consumer, and that the companies should not share in it in any shape or form. Only just recently it was shown by statistical study that, with all a gas company did in producing economies, the fruits of those economies were swallowed up by additional expenditure coming upon the concern from outside sources—among them being the burden of increased rates. There should be reason in these matters; and it was most unreasonable to ask that the low standard of 2s. 6d. should be reduced lower still. We are glad the Duke of Devonshire's Committee took this view; and, while giving the Company the illuminating power standard desired, they declined to depart from the model clause as to the "Metropolitan" No. 2 burner, or to reduce the standard price. Almost at the last minute, too, the Council tried to get foisted upon the Company a calorific power standard and test, in addition to the illuminating power standard and test. It would be interesting to know who instigated the Council to make this second unreasonable proposition. The matter is referred to in the editorial columns; but here it may be recorded that the Committee again refused to be drawn into committing an injustice.

INCIDENTS IN A LONDON GAS-DISTRIBUTING ENGINEER'S CAREER.

The brief announcement in the "Journal" last week regarding the retirement of Mr. G. F. L. Foulger from active duty as the Chief Distributing Engineer of the Gaslight and Coke Company, while still as capable as ever, save for the one physical disability then mentioned, merely presents to us the closing page of a very vigorous and responsible official life. But that page induces the mind to reminiscence, and from reminiscence to research; and the exercise, with the incidents known and those disclosed, results in much that is interesting. It could not be otherwise in the career of anyone occupying such a position, with its attendant unique conditions, as that of Chief Distributing Engineer of the Gaslight and Coke Company, whose district is without compare for density of property and population in no less than 62 square miles, is without compare for the amount of traffic passing over the surfaces of the streets, and is without compare for the magnitude of the subterranean works and traffic. All of which conditions constitute the official position that Mr. Foulger has lately quitted one that is unique; and the characteristic has been intensified during his tenure of the office.

The Foundation of a Career.

It is nearly fifty years since, as a youth, the subject of this sketch became connected with Metropolitan Gas Supply; so that he has been a close spectator of, as well as an active worker in connection with, some wondrous changes that have come over the face and workings of gas supply in London. It was, to be precise as to date, in the year 1860 that Mr. Foulger commenced his gas-supply career in the old, and then soon to be defunct, Ratcliff Gas Company, of which his uncle, Mr. Samuel Foulger, was a Director, and two years later (as the "Journal" reports of the meetings at the time show) the Chairman. It was anything but a prominent position that the young "G. F. L." occupied in those days. There were not the same positions for youngsters, nor the same facilities offered for training, when London's gas supply was in the hands of thirteen more or less small Companies as obtain in the present days; and the Secretary, and not the technical officer, of a Company was then *facile princeps*. A boy had to "rough it." He went into a works, and had to turn his hand to anything and everything he was directed to do. There was no help for it; and every boy who had the capacity for realizing it knew that, in the technical work of the gas industry, he would have to be the architect of his own fortunes. Young Foulger (notwithstanding that an uncle sat at the head of the Board room table) had to go out and clean lamps, clear out services, attend to complaints—in short, he had to take his share of the drudgery work, whether on the works or on the district. "And a jolly good training it was for a boy," he has been heard to emphatically remark when reflecting on those times. With the Ratcliff Company, young Foulger remained for four years; and then the North Woolwich Gas Company, requiring a good all-round hand, without an official position, engaged London's future Chief Distributing Engineer. What the appointment was going to lead to was as far from anyone's thoughts then as it was that London would be burrowed for the accommodation of electric trains as it is to-day. But it set Mr. Foulger on the high road to the future position. The North Woolwich Company was originally a private piece of enterprise on the part of Sir Morton Peto, and Messrs. Brassey and Betts. They built the old Victoria Docks, and put up a small gas-works for the purpose of supplying the neighbourhood. A Company was subsequently formed, called the Victoria Docks Gas Company, of which the late Mr. George Parker Bidder, the eminent Engineer, was Chairman, and Mr. Samuel Bidder was an active Director. The Company developed into the North Woolwich, but its original name largely clung to it. Passing another four years, and we come to 1868, in which year the Gaslight and Coke Company acquired that enormous tract of land from the Ironmongers' Company known as Beckton. The Directors of the Victoria Docks Company took genuine alarm over the sale of their residual products with such a mammoth concern in their very midst; and, on the other hand, the larger Company did not like another Company supplying the area surrounding their big works. The result was an offer of purchase from the latter to the former, which was accepted with an avidity that was eloquent of a feeling of relief. It was a purchase outright.

Forty Years Ago.

From that purchase in 1869 dates the beginning of the career of Mr. Foulger with the Gaslight and Coke Company. He by that time had had considerable practical experience in the newly acquired territory; and this practical experience the Gaslight Company thought it would be well worth having at their disposal—more particularly having regard to the two 48-inch trunk mains that were being laid to connect Beckton with the heart of London. Thus opened a long period of distinguished service. It was in 1868 that a commencement was made with the laying of the 48-inch mains; and gas was travelling through them in 1870—the first gas that was conveyed by the mains being delivered to the old City gas-works at Blackfriars. As Mr. Foulger was first retained in 1869, he has at the time of his retirement seen forty years' service in connection with the Gaslight and Coke Company. At the outset, however, there were territorial restrictions. Mr. Johnson was then—bearing the titular distinction of Chief Inspector—in charge of the outdoor department of the Gaslight and Coke Company. Intersecting the old district of the Company and the new one taken in by the purchase of the North Woolwich Company and Beckton is the Commercial Gas Company's area. If one looks at the map of the London gas-supply districts, it is seen that the easternmost part of the Gaslight and Coke Company's area is Aldgate; then comes the Commercial Company's area; and the Gaslight Company join up again at the other side at Canning Town. So that between Canning Town and the Beckton works, the 48-inch mains ran entirely through the old district of the Victoria Docks Gas Company; and to look after this new area was what Mr. Foulger of forty years ago was appointed for—occupying the same independent position between Beckton and London that Mr. Johnson (who thought it would be inconvenient for him to take charge of the additional area) did in the larger and more important trading district. It was in 1884, that Mr. Robert Harris came on to the scene as the Chief Distributing Engineer of the Company; and he continued in the position until 1889, when, sad to recall, he became mentally deranged, but death mercifully removed him at the home where he spent his latter days. The enforced relinquishing of the position by Mr. Harris resulted in the appointment of Mr. Foulger to the larger office; but he took over not only the work that Mr. Harris had performed, but with it was amalgamated that which had been his own special charge over the previous twenty years.

Amalgamations and Distribution Extensions—One Cause of an Intricate Distribution System.

At this point of our narrative, it is interesting to remark that the long association with the Gaslight Company of the Distributing Chief who has just retired covers the period of the enormous growth in territorial and business magnitude of the concern. Originally there were thirteen Companies supplying in London. Now there are only three. Following the year that Mr. Foulger became associated with the Company, the City of London and the Great Central Gas Companies were amalgamated with it. The Victoria Docks Company was also annexed. Then succeeded other amalgamations—particularly noticeable ones being the Imperial in 1875-6, which practically doubled the Gaslight Company's scale of operations; and the last Company to be amalgamated was the London in 1883. These amalgamations are only referred to as having come within the considerable span of Mr. Foulger's connection with the Gaslight and Coke Company, and to illustrate how the imposing Company, with its 62 square miles of densely populated and occupied area, has been brought to its present extent—requiring, as it does now, a main canalization of 2200 miles of cast-iron pipes—varying in size from 48 inches down to 3 inches.

Of course certain of these amalgamations were made more or less possible by the trend of popular opinion prior to the year 1868, and the construction of the Beckton works. Just before that time, objections were raised to the extension of gas-works within the cities of London and Westminster; and the Gaslight and Coke Company recognizing, in view of this, the difficulty that they themselves might be in with regard to supplying the increases of demand, and also the similar difficulties that other companies would possibly experience, if immediate provision were not made, and realizing at the same time the advantages that would accrue from the total abolition of the manufacture of gas within the cities of London and Westminster, made a very bold bid for the future through the great scheme of works at Beckton. All that foresight suggested, all that was schemed and planned (whether in all respects wisely or otherwise is not a question of the present), came to pass; and now the cities of London and Westminster are absolutely destitute of any gas-manufacturing stations. Valve houses and gasholders may be found, but not manufacturing plant. In more recent years, too, gas manufacture has ceased at other stations—not because the extension of the works was prohibited, but because the transfer of operations meant greater economy, having regard to the geographical positions of the works. Pimlico, Westminster, Brick Lane, Curtain Road, Haggerston, and King's Cross are the stations particularly in mind in this connection.

All these are matters that are within the personal recollection and experiences of Mr. Foulger, who, at the date of his retirement, was the then oldest officer in length of service of the Company. His has been, as said, a unique experience. Difficulties have been encountered, and have had to be overcome, such as probably have not been met with in any other gas-distribution area in the world. Of course, the abolition of the various works and the maintenance without intermission of the supply during the transition stage from one works to another, was alone a matter for deep and considerable thought and calculation, inasmuch as it was necessary to run mains to pick up at certain points the whole of the outlets on the works which previously existed; and this is one reason for the large and intricate high-pressure system which has now existence in the area of the Gaslight and Coke Company.

The Stimulus of Competition.

The accession of Mr. Foulger to the more important office of Chief Distributing Engineer—1889—with its multifarious duties and responsibilities, it will have been seen, synchronized with the times when electrical undertakers were flush with anticipation of being able to largely occupy the field that had been so long in the

possession of gas suppliers. The year 1888 saw the amendment of the Electric Lighting Clauses Act of 1882; and immediately afterwards—or rather in the year 1890—there was a crop of applications for Electric Lighting Provisional Orders such as has never been exceeded in any one year since. It was realized by Mr. Foulger that, however much gas companies might fight to maintain their position, they would find a formidable competitor in electric lighting; and therefore that it was incumbent upon them to seek additional outlets for their commodity. Those were days when prescience was needed. Then it was that the Chief of the Distributing Department of the Company placed before the Directors a scheme for popularizing the use of gas for other purposes than lighting. The scheme incorporated the opening of show-rooms, and the renting of town halls and other public buildings, particularly for the purpose of illustrating the advances and advantages of gas for cooking and heating, together with lectures and demonstrations by ladies. This was twenty years ago; and therefore the central figure in this sketch may truly be described as a pioneer in this direction of popularization. It was a big departure for the times. To a very large extent, gas offices were then situated at the works; and the works were more often than not located in back places, where the better class consumers would not go from choice. Advertisement was the thing for the times; and it was the policy Mr. Foulger induced the Directors of the Company to adopt, by going out into the main thoroughfares for displaying their goods, and demonstrating what those goods were capable of doing. The first show-room in the Gaslight and Coke Company's district was at Goswell Road; and from that inceptive stage sprung the show-rooms, in leading streets, practically all over the Company's extensive area.

BUSINESS REVOLUTIONS IN CHARACTER AND MAGNITUDE.

Then came the slot meter system; and the Gaslight and Coke Company entered upon this new business. This, in such an area, meant a tremendous addition to the work of the Distribution Department—more than to any other. Simultaneously, too, came the (it had not been so before) successful incandescent mantle; and this revolutionized the whole system of gas lighting. Great as has been the work inside the gas manufacturing stations, many as have been the changes, they cannot claim to be in their effect on the gas industry superior to those vast changes that have come over use and application in the areas of gas distribution. Gas-stoves have come to be looked upon as a necessity in practically every house; and the slot meter has made such enormous strides that, in the Gaslight and Coke Company's district, the prepayment consumers now exceed by more than 50,000 the ordinary consumers—that is to say, of the total of 558,701 consumers in 1908, 254,880 were of the ordinary class, and 303,821 were on the slot system. What does this mean? It means that a new class of consumer has come on in the past twenty years which exceeds in number the total of the ordinary consumers connected up during the past hundred years. Concerning the introduction of the incandescent burner, while Mr. Foulger cannot claim to be a pioneer in the matter of the maintenance of such burners, he can claim to have been one of the first to see the necessity for keeping in order these burners, owing to their more scientific nature and action than the old flat-flame predecessor; and, in consequence, burner maintenance was introduced by the Company. This all shows how greatly the work of the Distribution Department of the largest Gas Company in the world has developed during the time Mr. Foulger occupied the position of Chief Distributing Engineer. It has been indeed a transition period of extraordinary fecundity in the history of the industry.

(*To be concluded.*)

Coal-Cutting Machines.—The Chief Inspector of Mines in the Durham District (Mr. R. D. Bain) reports an increase of 23 coal-cutting machines last year as compared with the previous year; making a total of 175 for the district. Of these, 72 were driven by electricity, and 103 by compressed air; the total amount of coal produced being 1,131,044 tons. From these figures it is seen that compressed air is still regarded as the best means for driving coal-cutters in the Durham district. It assists ventilation, is easily handled, and is not accompanied by the dangers incident to electricity in fiery mines. On the other hand, it is less efficient, for the leakage is relatively greater when the working face is a long distance from the shaft.

Gas-Pipe Industry in Germany.—According to the annual report of the British Consul on the trade of Düsseldorf (embracing Westphalia and the Rhenish Provinces), the gas-pipe industry last year was not as badly off as other iron industries. The Gas Pipe Syndicate were, however, obliged to reduce their prices, and exports were for a time carried on at a losing figure. An attempt was made by a large Düsseldorf firm of manufacturers to create a gas-pipe convention between British, American, and German firms. It was almost formed, and only failed to be concluded on account of the smaller British firms being unable to come to an understanding with the larger ones as to the terms already agreed upon by the largest and most important British and German firms. As the convention was not carried through, a steady and keen competition broke out, by which the manufacturers in the United Kingdom and Germany lost money; gas-pipes being sold at absolutely unremunerative prices. Had the convention been agreed upon, the result of the year's work would, it is stated, have been very different for both British and German manufacturers.

THE EIGHTH IRONMONGERY EXHIBITION.

Representatives of the Gas Industry.

THERE is now being held at the Royal Agricultural Hall, Islington, the Eighth International Ironmongery, Hardware, and Allied Trades Exhibition and Market—and a very good show it is. Altogether, the exhibition is the most comprehensive of the series that has been held. The promoters are the Ironmongers' Federated Association; and under the organization of the International Trade Exhibitions, Limited, over two hundred stands have been fitted up with the innumerable goods that go to the making up of the stock of an up-to-date ironmongery business. Among such goods, of course, it is only proper that appliances for the efficient utilization of gas should find a place; and therefore it is gratifying to be able to state that in connection with both the lighting and heating branches of the industry fairly representative displays are made.

A considerable amount of space is occupied by the Imperial Stove Company, of Leamington, one of whose main exhibits is the Pirrie patent water circulating hot-plate—named the "Fitall"—which was recently described in the "JOURNAL." It will be remembered that this can be fitted to any gas-cooker—converting the ordinary open top into a closed range, and making the hot-plate into a shallow boiler. By this means, the waste heat from the hot-plate is utilized to provide a supply of hot water. There is, too, a good show of cookers, fires, radiators, greenhouse boilers, combined carving tables and hot-closets, &c. Greenhouse gas-heating apparatus is also to be seen on the stand of Messrs. Charles Toope and Son, of Stepney. Among the large variety of goods displayed by the Carron Company, gas cooking and heating appliances take a prominent place. There is a new pattern cooker, made in three sizes, and of substantial design, the moderate price of which renders it specially desirable for the hiring-out purposes of gas undertakings. It is packed, and enamelled both inside and out; while all the fittings are loose. The hot-plate is a lifting one, with a ratchet arrangement to keep it in position when raised. The "Forth" boiler and washing copper has been more specially designed to meet the demand for a cheap, economical, and efficient portable gas-heated washing copper. The boiler is constructed of strong copper, heavily coated inside with pure tin. The top, hinged lid, base, and legs are constructed of cast iron—the top and lid galvanized; and the body of galvanized sheet steel. To the fires, grillers, rings, carving-tables, radiators, &c., shown by the Carron Company, it is not necessary to specially refer; but mention may be made of a folding gas hot-plate, containing a boiling-ring and grill with removable deflector, which is specially intended for fixing to the hobs of coal-ranges. This is fitted with folding automatic and self-locking supports; and there is no complicated mechanism to get out of order. When not in use, the hot-plate stands on end at the side of the range, in which position the hob-space occupied is only 11 in. by 2 in. The taps are well protected; and they and the gas feed-pipe do not move with the grid and burners, but are screwed rigid to the fixed supports of the hot-plate. Consequently, it is pointed out, there is no leakage and no unnecessary wear of the vital parts. The firm also show the "Beetonette" portable coal-range, fitted with convertible gas-oven and the hot-plate attachment already described.

Coming to the lighting department, the stall of Messrs. Falk, Stadelmann, and Co., of Farringdon Road, may first be alluded to. There is an excellent show of fittings for both upright and inverted burners; and, of course, the "Veritas" gas mantles and burners are on view, as is also the "Vesta-Veritas" high candle-power burner. The reversible pendants for upright or inverted burners attract attention; and there is a choice selection of the latest patterns of globes. The wall-brackets, in brass and oxidized copper, are displayed to great advantage on several panels; and specially noticeable among them are those designed for bijou gas-burners. Inquiry as to any particular novelties on view, revealed the firm's new heater for fixing to a gas-bracket. The principle of this is a bunsen flame working upon an asbestos pad; and the appliance is not only useful, but ornamental—the latter effect being secured by the provision of a glass fringe. Globe galleries are also to be seen provided with spring clips, instead of screws. These, besides being more quickly adjusted than screws, obviate any possibility of fixing the globe too tightly. Messrs. J. Southerton and Son, of Birmingham, show gas-brackets, pendants, and small fittings of every description; and Messrs. H. J. Pratt and Co., of the same city, include on their stand a number of most inexpensive brass and oxidized copper incandescent gas-fittings. Many of the patterns are really artistic.

The High-Pressure and General Gas Lighting Company, of Leamington Spa, light the Imperial Stove Company's stand with their "Invicta" low-pressure inverted lamps, which, with a consumption of $3\frac{1}{2}$ cubic feet, are claimed to give a reflected light of 120 candles. These lamps for outside lighting are wind, rain, and dust proof, and well riveted and enamelled. They can be ignited both from outside and inside. There is, too, a large-size indoor pattern, constructed specially for places of worship, halls, public institutions, &c. "Invicta" burners are also supplied for ordinary domestic purposes; and it is claimed that they burn under every gas pressure without carboning. The gas regulating injector is said to be reliable under every condition; and the regulation of air is so arranged that, once fixed, it cannot be easily altered. The Harquin Pendant Company, of Kentish Town, in addition to their patent gas-pendant, show the "Harquin" patent distance

gas-switch. In this, a special valve, with a bye-pass, is placed on the gas-fitting, and is operated, by wires fixed upon the wall, from a tumbler switch—the valve closing by means of a spring when the tumbler releases the wire. As the valve is placed at the top of the chandelier, only one, of course, is necessary, whatever may be the number of burners on the fitting—arrangements being made for a bye-pass supply to each of them. The "Harquin" rise-and-fall pendant is provided with a spring winding device to absorb the flexible tube from which the burner is suspended as soon as the weight is taken off by lifting the burner. The fitting can be easily adjusted to any reasonable weight, and will stay in position. An automatic check prevents falling in the event of anything interfering with the working of the winding device.

In addition to the "Veritas" mantles, there are several other makes exhibited. Messrs. Curtis and Harvey, of Gracechurch Street, show the well-known "Ironclad" patent metal top upright mantle—"British made by British labour." The metal top, which, of course, adds to the durability of the mantle, is composed of an alloy of metals which have been found to withstand the effects of heat. The firm also make high-pressure mantles—as well as the "Iris" and Special "Iris" inverted mantles in both ordinary and bijou sizes. These latter have a three-lug head which fits almost every burner. The light-giving powers of all these mantles are claimed as being exceptionally good. The Ronai Light Works, Limited, of Finsbury, have a stall filled with new pattern inverted burners, mantles, and accessories. There is a soft inverted mantle, produced after a lengthy period of experiment; and for it the firm claim all the advantages of a collodionized mantle. It can be utilized in connection with any burner; and its brilliancy is said to increase with use. A thread runs round the top, for fixing on to the ring. The firm also make upright mantles of various brands (including the No. 14, "guaranteed for one year," and made with new machinery, which obviates any unnecessary handling and ensures safety against breakage); and, in addition, they have a large range of high-class burners, among which are some china inverted patterns. Space has also been reserved in the exhibition for the Laddite Incandescent Mantle Company.

Other exhibits of interest to "Journal" readers include the "Empress" gas-saving cooker, shown by Messrs. Hall, Bayliss, and Co., of Hatton Garden. This is made to stand on an ordinary gas-stove, or for use in connection with a gas-ring. A flue which runs through the cooker, to a shallow compartment extending over the whole of the top, is placed over the gas-flame; and there is a big claim made for the appliance—"that it cooks in the same time as an ordinary gas-stove, but with less than one-third the quantity of gas." Water can be boiled on top while cooking is proceeding in the oven. Messrs. John Russell and Co., of Queen Victoria Street, exhibit Talbot's patent machine for tapping water and gas mains and for inserting ferrules under pressure. This machine, which is made in aluminium, is extremely light, and will fit any sized main. It is claimed that when using it loss of gas is entirely avoided; while it is guaranteed water-tight at any pressure. The same firm exhibit gas-fittings, cocks, valves, &c. On the stand of Messrs. W. Canning and Co., of Birmingham and Clerkenwell, there are some polishing lathes; and that of Mr. William Shaw, Leeds, includes portable gas coppers. The London Warming and Ventilating Company, of Newman Street, W., do not confine themselves to anthracite stoves, but show also their "Yule Log" gas-fires (which are a very good imitation of a wood fire) and the "Record" gas-steam radiators. The British Trading Syndicate, of Fleet Street, draw attention to the "Frugal" gas saver and governor, which, it is said, "only allows the requisite quantity to pass into the burner which is necessary for the maximum amount of light obtainable, no matter what the pressure from the meter may be." It can be instantly fitted to any burner; and it is made for use both with flat flame and incandescent types. The Elbard Stove Company, of Queen Victoria Street, exhibit toasters, iron-heaters, and gas-rings for use therewith; and Messrs. J. B. Stone and Co., of Finsbury Pavement, the "Universal" ratchet, for drilling holes in close places where no other ratchet will work.

The petrol-air gas systems shown include those of the Loco Vapour Gaslight Company, of Manchester; the British and Colonial Lighting Company, of Mortimer Street, W.; the Praed Patent Safety Gaslight Company; and the Cox plant. The Dennis Acetylene Illuminating Company's exhibit is indicated by the title.

Lowering a Long Water-Main.—A 30-inch cast-iron water-main laid on a timber trestle in Devereaux Street, Philadelphia, was lowered a short time ago to low concrete piers by the Bureau of Water, in connection with the grading of the street. The section moved had a total length of about 1100 feet; and the trestle was 27 feet high. The supply was shut off and the pipe cut into two sections, each approximately 550 feet long; so that the work was done in two successive operations. The trestle was of quite a simple two-post type, the "bents" being cross-braced, and having diagonal bracing running longitudinally from one to another. Framework was erected on top of each bent over the first half of the pipe to be lowered, and was fitted with a screw long enough to reach to the final resting-place of the pipe. The screw was held by a nut, bearing on the top of the frame and having two handles. The lower end of the screw was attached to a strap passing under the pipe. Two men were placed at each screw, and the entire 550 feet of pipe was lowered simultaneously.

GERMAN GAS AND WATER ASSOCIATION.

Its Fifty Years' Activity.

Mention was made in the report of the proceedings at the recent Jubilee Meeting of the German Association of Gas and Water Engineers at Frankfort (given in the "Journal" for June 29, p. 970) of an album, which was presented to those attending the meeting, and which constituted a memento of the Jubilee of the Association, and an interesting retrospect on its history and activities. It is pointed out in this retrospect that the German Association—which was founded in 1859—was not only the first Association in Germany for a special industry, but also the first Gas Engineers' Association in the world. The English Gas Managers' Association was not founded until the year 1863. It will be useful to extract a few particulars from the album as to the origin, development, and work of the German Association.

The idea of the Association was due to Sonntag, of Mainz, and Engelhard, of Frankfort-on-the-Maine, who called a meeting of gas engineers of their acquaintance at Stuttgart in April 1859, at which it was decided to found the Association and to hold its first annual meeting during the following May at Frankfort. The Association of German Engineers had been founded some twelve months previously. The purpose of the Association was clearly defined in its first statutes as threefold—viz., (1) The closer personal acquaintance of the men concerned in the industry, through annual meetings; (2) the interchange of experiences and ideas, and the discussion of opposing views on technical questions; and (3) the carrying out of investigations and experiments. The retrospect contained in the album is divided according to these three headings.

In regard to the furthering of personal acquaintance of gas and water men, it is pointed out that only two years before the inception of the Association, the German gas journal (the "Journal für Gasbeleuchtung") had been founded by Schilling, as Editor, and Oldenbourg, of Munich, as Publisher, but that the contents of its early volumes were mainly derived from foreign sources, owing to a disposition to regard the work carried out on German gas-works as more or less a matter of secrecy. Permits and letters of recommendation were necessary for admission to any gas-works. It was in dispelling this atmosphere of secrecy that the first few years of the German Association's existence were so beneficial to the industry in Germany. The recognition of the German gas journal as the official organ of the Association was instrumental in bringing communications to its pages from all sections of the gas industry in the country.

The first President of the Association was E. Spreng, of Nuremberg, who was followed first by G. Blochmann, of Dresden, who was succeeded by S. Blochmann, also of Dresden. The leadership of the Association was thus carried on up to the year 1865, when S. Schiele, of Frankfort-on-the-Maine, began his eight consecutive years of presidency, to which were subsequently added another six years in the same high office. But for the election as President, in 1874, of W. Oechelhaeuser, the founder of the German Continental Gas Company, and in 1879 of E. Grahn, of Hanover, S. Schiele would have been continuously President from 1865 down to 1881. It was largely due to the personal influence of Schiele and Schilling, whose well-known "Handbook of Gas Manufacture" appeared in 1860, that the German Association attained its prominent position. Schilling had for many years during the presidency of Schiele been on the Council of the Association, and towards the end of Schiele's term of office, the name of H. Bunte appears also in the list of Councillors. In 1882, H. Bunte was elected President; and the connecting link was thus formed between the early history of the Association and the present time. The earlier Presidents no longer survive to take part in the affairs of the Association; but Professor Bunte is certainly still the most active member of its Executive. Among subsequent Presidents in the eighties and nineties may be mentioned R. Cuno, of Berlin, who was elected five times, A. Hegener, C. Kohn, G. Wunder, W. von Oechelhaeuser (son of the founder of the German Continental Gas Company, and its present Managing Director), and L. Körting, who retired a few years ago from the managership of the Imperial Continental Gas Association's works at Hanover. The Associatian has encouraged intimacy between its members and their confrères in other countries; and a cordial reference is made to the visits of the members of the Institution of Gas Engineers to Germany in 1899 and 1908 as guests of the Association, and to the welcome which members of the Association have from time to time received abroad, especially in England.

The next section of the album is devoted to a general review of the work done by the Technical Committees of the Association, on the individual work of each of which there is a subsequent report. A list of the papers read at the meetings of the Association from its first year onwards is given; and a glance through their titles recalls the phases through which the gas industry on the Continent has passed during the last fifty years. At first, practically all the larger gas-works were in the hands of English companies, managed by English engineers, constructed with English materials and plant, and carbonizing almost exclusively English coal. Then ensued the gradual development of German constructional engineering; the transfer of many of the undertakings to municipal administration; and the opening up and development of the German coal fields. The introduction and

competition of petroleum, and subsequently of electric lighting, are marked by the titles of many of the papers. Others refer to the inception and the evolution of the gas-engine. The changes which have taken place in methods of heating retort-settings, and in the forms of retorts are also faithfully portrayed by the list of communications. Naturally also the transition from the early methods of burning gas for lighting purposes to, first, regenerative burners, and, secondly, to the incandescent system, is well indicated by the series of papers devoted to the use of gas for lighting.

The third section of the album refers more particularly to the undertaking by the Association of investigations on matters connected with gas and water supply. Most of these investigations have been conducted through the medium of one or other of the Technical Committees of the Association; and it was not until 1907 that the Instructional and Experimental Gas-Works were established at Carlsruhe, specially to deal with research work in connection with gas manufacture. A list of the scientific investigations conducted by, or under the direction of, Professor Bunte, the General Secretary of the Association, the expenses of which were wholly or partly defrayed by contributions from the fund established for scientific purposes by the Association, is given. In this connection, tribute is paid by Professor Bunte (who is responsible for the compilation of the "Memoir") to the assistance which the gas industry indirectly received from Robert Bunsen and M. von Pettenkofer, who, though not directly associated with it, greatly benefited it by their scientific investigations.

In regard to the work of the Technical Committees, special memoirs are contributed by men who have taken an active part in their work. The Photometric Committee have had continuous existence from 1860 up to now, and many investigations on standards of light and methods of photometry have been made at their instance. The memoir in regard to this Committee is written by H. Krüss, of Hamburg. Dr. Schilling, of Munich, writes the story of the work done by the Heating Committee, which was established in the year 1884. The Committee have carried out many investigations on gas-stoves and methods of heating by gas, on the use of coke for heating purposes, on calorimetry, and on the hygienic aspects of different modes of heating dwelling-rooms and buildings. A Committee was established in 1867 to investigate the construction of gas-meters; but the Gas-Meter Committee as now established began their work in 1886. They have conducted many investigations on gas-meters, and in particular on the construction, and the materials used for the membranes, of dry meters. This work, as recent reports indicate, is still being pursued. The account of the work done by the Committee has been prepared by C. Kohn, the present Chairman. The Water-Works Committee of the Association was founded in 1888, and has done much good work in ascertaining the conditions of working at different water-works and in publishing statistics in regard thereto. They have been useful in watching, on behalf of water undertakings in general, legislative proceedings affecting their interests. The history of this Committee has been compiled by F. Reese, of Dortmund. In 1897, a Committee was appointed for the purpose of establishing standard dimensions and conditions for Gasholder Construction. The Committee have issued reports embodying suggested standard conditions in 1900 and in 1906, which have been generally accepted in Germany. The account of this work is signed by M. Niemann, of Dessau. A Committee was established in 1894 for Standardizing Water-Meters, and the scope of their investigations was subsequently extended to include the standardizing of gas-threads. The latter subject has become of international importance, and is still unsettled. The account of the work of the Committee has been prepared by W. H. Lindley, of Frankfort-on-the-Maine. The same gentleman is responsible for a history of the work done by the Electrolysis (or Vagrant Currents) Committee of the Association, which was founded in 1897, when the spread of electric tramways had been found to lead in many cases to serious corrosion of gas and water mains through the return currents. This Committee have undertaken many investigations as to the conditions which determine the electrolysis of mains laid under streets where electrical traction is established; and they are still engaged on an interesting series of researches. In 1896, a Committee was instituted to deal with the question of the training of gas engineers and fitters. A report of the work done by the Committee since their institution is given by W. von Oechelhaeuser, who has taken especial interest in the technical training of men employed on gas-works. Finally, Professor H. Bunte gives an account of the establishment of the Committee for the Instructional and Experimental Gas-Works of the Association, which came into being in consequence of a resolution passed at the meeting of the Association in Hanover in 1904. The work done by this Committee, especially in the direction of the investigation of gas coals, is so recent that it must still be fresh in the minds of readers of the "Journal." The results of the latest series of investigations made at this works on a large number of gas coals will form the subject of an article in an early issue. Though at first sight these investigations appear only to refer to coals of German origin, a study of the work recorded in the report will show that many of the conclusions are of general application, and of cosmopolitan interest.

The record presented in the album, of the activities of the German Association during the fifty years of its existence, is one of which any technical Institution may justly be proud, and on which it may be heartily congratulated.

REFLECTIONS ON CARBONIZATION.

III.

By Thomas Settle.

The following are the average results obtained with horizontal retorts at four different gas-works.

The volume of gas produced between the first hour and the fourth hour (four-hour charges) varies from 80 to 85 per cent.; and the illuminating power in the same period of time varies from 50 to 60 per cent., agreeing in extent to what Professor Lewes said in his lecture to the Irish Association—

> There is little doubt that, even with the best horizontal retort practice, there is a loss of 2) per cent. in the candle and calorific value of the gas owing to the analytic and synthetic actions taking place from the improper conditions under which 80 per cent. of the charge is carbonized.

Miller showed the importance of restricting the period that gas should be kept in the zone of heat. He obtained 46 per cent. of the whole production in the first hour, with a specific gravity of ·677; while the fourth hour only represented 8 per cent. of the volume obtained, and a specific gravity of ·322.

Mr. Newbigging gives a table in his "Handbook" showing the rate of production of gas. The first hour represents 50 per cent. of the total volume obtained; while that of the fourth hour is only 4 per cent. of the total volume.

Mr. Butterfield shows that at the end of two-and-a-half hours he obtained half the volume, carrying the maximum illuminating value, while the fourth hour only gave 20 per cent. of the volume with the illuminating value 50 per cent. below the maximum obtained in the earlier stage of distillation.

It is an axiom that the richer coals give off their gas more quickly, so much so that with good heats sometimes as high as 60 per cent. of the volume of gas is obtained the first hour of distillation, after which the curve line of production drops rapidly.

From the foregoing facts bearing on the carbonization of coal in horizontal retorts, it would appear the time for the destructive influences by any secondary action during the first hour of distillation is altogether too short under the conditions, and by reasons of: (1) Rapid evolution; (2) practically no penetration through hot coke; (3) maximum velocity of travel; (4) short exposure to surface contact by reason of the average high velocity; (5) the hour being the "moist stage" of production; and (6) the core of the volume, protected by an envelope of gas undergoing decomposition by actual contact with the sides and top of the retort for a period only, at the most, of one-and-a-half seconds along the average length of the retort, and the average time for its transit from the average points of distillation and evolution. At the end of the first hour, there is only then left remaining 50 per cent. of the volume, with a much lower illuminating value, to undergo the changes of the next three or five hours as the case may be. Conclusive proofs have already been given of the very rapid and serious falling off in volume and quality in the remaining hours of distillation, resulting in poor gas, deposition of carbon, formation of naphthalene, excessive sulphur, and other troubles, including choked ascension pipes, through this time of the "dry stage" period of carbonization from the point where cracking-up of the tar commences and on to the finish of the charge being exhausted of everything that was volatile.

It would almost amount to a challenge for anyone to advance the opinion that there is really no such phenomenon as reflected or radiant heat from the crown of a retort during the distillation of the coal. There certainly is in an empty retort, or in one where a charge lays that is completely burned off. There is no reason to alter the opinion expressed by me in a "Criticism of the Dessau Vertical Retort-Setting and Working," published in the "Journal" for March 13, 1906.

> The influences attending the decomposition of the gases from a charge in horizontal retorts, I venture to say is not augmented to such an extent as is imagined by the deflection of heat through the free space between the charge and the crown of the retort; and, as the result of many experiments, I believe it is only the thin layer of gas immediately in contact with the crown and sides of the retort which attains anything like the temperature of the retort itself.

Figures showing the temperatures of gases as they are evolved and pass away, will be given later. I am satisfied that there is an enormous difference in the temperature of the core of the volume as it passes along and the gas which is in immediate contact with the top of the retort during the whole time a charge of coal is undergoing carbonization. A surface at a high temperature is easily and readily seen. Yet on opening a retort-lid quickly, scarcely anything can be seen for a few seconds of time. *Why?* The velocity with which the gas evolved moves from any divided portions of the length of the retort varies so much that it is difficult to place a speed limit on Professor Lewes's phrase in the course of his Irish Association lecture: "Quickly washed out up the ascension pipe by the push of the gas behind."

It is somewhat doubtful whether there is any pushing in the back part of a single retort. By far the largest deposit of carbon is found at the back end of a retort that has a solid end.

I am satisfied, from analyses of gases taken from the back one-fifth length of a retort, that whatever may be claimed for being pushed along, there is something in this back part (the large deposit of carbon is proof of residence) that enjoys a state of

dormancy from its birth, and during its short life is fed by the more lively of its nationality, who have no time to wait to be pushed along and outside.

The full meaning of this quiescent state in the back portion of a horizontal retort is that it is just so much too long (more than 30 per cent.) for the more correct zone length of heat that gives the best conditions under which coal is carbonized, and gas removed quickly through a shorter zone length space for travel.

In repeating that "It is the longest hill that wears the slipper down most," so it is with horizontal retorts much too long to secure the best conditions under which coal should be carbonized. What is true is safe, I am satisfied. Mr. Newbigging says of the deposit of carbon—

> This deposit is due principally to the pressure produced by the resistance offered to the passage of the gas through the different apparatus.

Wherein lies the progress since Murdoch's time, that there should at this day be any pressure at all inside a retort, when the gas with a free and easy passage will move at a rate of 8 feet to 12 feet per second? It surely is not carbonizing under good conditions with horizontal retort practice to ever work a retort under pressure at all. Mr. R. Forbes Carpenter says, in his latest report, noticed in the "JOURNAL" for June 15 (p. 708):

> It is manifest, from consideration of the tabulated results, that, in applying the knowledge of the facts ascertained to large-scale operations in gas-works and coke-ovens, the consideration of what has been described as "rate of flow" has an enormous influence on the products obtained in the carbonization of coal. Temperature is by no means the only factor of importance.

Messrs. Folkard and Heisch, in a paper read at a meeting of the Southern District Association of Gas Managers, illustrated the rate of travel through a retort divided into ten equal parts; and they showed the average velocity of the back division to be only 0·75 inch per second; while the front division they showed to be 8 inches per second.

Regarding the penetration of heat through a charge, I would quote from Mr. Thomas Glover's recent Presidential Address to the Institution of Gas Engineers.

> It is very interesting to observe that the rate of carbonization proceeds more rapidly with narrow than with wide ovens.

This equally applies to all kinds of retorts. Mr. Glover, in his table of rates (as published), gives half-an-inch per hour as being the quickest from both sides of a chamber 12 inches wide. Some rates of penetration through charges in horizontal ◠ retorts show that 80 per cent. was upwards (no doubt assisted by side-rates), against 20 per cent. downwards. The downward rate has against it the rising through the crust formed of the gas coming from the interior of the charge; and it does not tend to prove that radiated or reflected heat through space takes any great part in assisting the downward penetration. In my criticism of the Dessau retort already referred to, I remarked—

> The transmission of heat through a charge of coal in a horizontal retort is not by any means equal; and my observations invariably proved that the upward carbonization equals three-fifths of the distance, and the downward (each assisted by the horizontal penetration) equals two-fifths of the distance.

The oft-repeated theory that the gas coming from the interior of the retort charge undergoes considerable decomposition by its passage through a jacket of red-hot coke, is too far worn out by proof in experiments and every-day practice, insomuch that in taking some of the uncarbonized coal from the centre of the charge (say, in the second or third hour) it will probably yield 15 to 17 candles; while a sample of gas taken from the retort after having passed through the jacket of coke gives 3 to 5 candles less illuminating value. I have many records proving losses of from 4 to 8 candles by the operation of passing gas through heated coke.

For the convenience of illustrating one or two experiments and experiences with horizontal retorts, let it be imagined that their lengths point north and south, being through retorts 21 feet long, with ascension pipes and hydraulic mains on each side. It is needless to detail charging operations, or yet the fact that a slightly deeper seal on the north side would turn all the gas to the south side, with the fatal effect already shown, and better demonstrated by inclined retort practice, where the ascension pipes are placed at the bottom of the angle—a kind of process something like descending into the crypt to reach the top of the steeple. Murdoch installed inclined retorts about the year 1805; and they so hurt his favour that he went back to the horizontal retort, which has been good enough to remain in use ever since his day.

Reverting to through retorts being placed north and south, it is very interesting work taking the temperatures and samples of the gas at different points, and for comparison to purposely shut off one side and repeat the sampling, and, further, to leave in the coke from a charge (say) on the north side, and put in a fresh charge on the south side, compelling the gas from the new charge to pass over the 10 feet of the charge of incandescent coke left on the north side. By these experiments, there may be found to what extent radiated or reflected heat really exists, and the difference of the gas in calorific and illuminating value at any point where carbonization is proceeding, and also the effect on the same gas in passing over the coke in the northern half. The results demonstrate the zone length where carbonization is taking place, and the heat length zone which it is so desirable to shorten. The temperatures and sampling may be done by fixing on the lid of the mouthpiece an ordinary stuffing-box, and using some suitable lengths of tube or pipe to pass through it.

I would commend these simple experiments to the younger men in the profession, who have such opportunities as will afford their carrying out the tests. Where a fully fitted-up test plant is available, it will be found doubly interesting to put a division-wall commencing with the first 2 feet of the retort, and charging that length only. Then move the block another 2 feet, charging and sampling again; and so on, ending with charging and sampling the gas in the various short lengths and the full length together. To anyone carrying out these experiments, it will be found that the results will prove an enormous difference in both quantity and quality between the front half-length of the retort and the back half-length. In plainer words, the results will doubtless prove that the back half-length is much the idlest part of any horizontal retort.

Many are looking forward with keen interest for further results from Mr. Thomas Glover's short, narrow, and moderately deep carbonizing chambers. One would, however, like to hear of these chambers being fed either intermittently or continuously, and the results noted.

More in the light of a complaint than anything else, I think Professor Lewes, in his lecture before the Irish Association, when speaking of Murdoch and the earlier times, said:

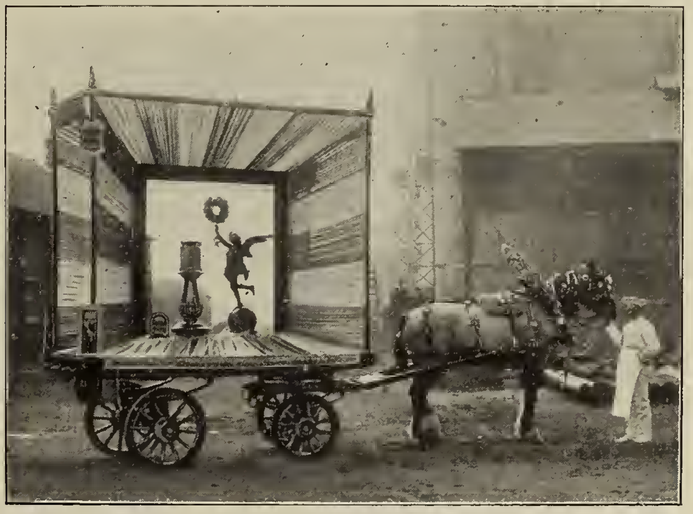
> This early period was richer in experiments on the subject of carbonization than almost any we have had since, as when once the horizontal retort gave satisfactory results, the only alteration made during the next seventy years was in material, shape, and setting.

How true! Facts at least show there is still no uniformity of action in the present methods of carbonization of coal in horizontal retorts.

ILFORD HOSPITAL CARNIVAL.

The Richmond "Model" Cooker Car.

Both gas and electricity were represented in the Park Ward Section of the great annual Hospital Carnival held last Saturday week at Ilford. Some 4000 people in fancy costumes took part in the carnival; and the procession was nearly 4 miles long. Gas pulled off a first prize. The car was arranged by the Ilford Gas Company and the Richmond Gas Stove and Meter Company, Limited, combined. It showed a Richmond miniature "Model"



cooker (being a contrast to the monster "Model" cooker of last year) on a pedestal, with a goddess figure in carved wood, holding over the cooker a laurel emblem of honour and excellence. A pleasing blend of heliotrope and gold draping radiated from the centre frame or picture; while the wording "Use Gas for Lighting, Cooking, and Heating" was in stucco writing, and in heliotrope and gold. The title of the car "The Goddess of Plenty" gave suggestion, among other things, to the large number of Richmond cookers in use in Ilford (about 10,000) and the prominent place gas holds in this important residential London suburb.

Marriage of Mr. Frank Livesey.—At St. David's, Exeter, on Thursday last, the marriage was solemnized of Miss Harriet Gwyndoline Barnes Roberts, daughter of the late Mr. Lionel Roberts, M.R.C.S., and Mrs. Roberts, of Higher Duryard, Exeter, and Mr. Frank Livesey, of Maidstone, elder son of the late Mr. Frank Livesey, M.Inst.C.E., and Mrs. Livesey, of Buckland Corner, Reigate. The bride was given away by her brother, Mr. Copleston Gay Roberts. She was attended by two bridesmaids—the Misses Queenie and Jean Livesey, sisters of the bridegroom, whose best man was his brother, Mr. A. George Hilton Livesey. After the ceremony, a reception was given by Mrs. Roberts, at Higher Duryard. During the afternoon, the bride and bridegroom left for North Wales, where the honeymoon will be spent.

THE RECENT EXAMINATION IN "GAS SUPPLY."

Answers to the Questions Put.

[SECOND ARTICLE.]

8. (A) Give sketch in section of a station governor, and explain how the pressure in the district is controlled. Describe the construction of the valve you consider most suitable for use with governor connections. [36.]

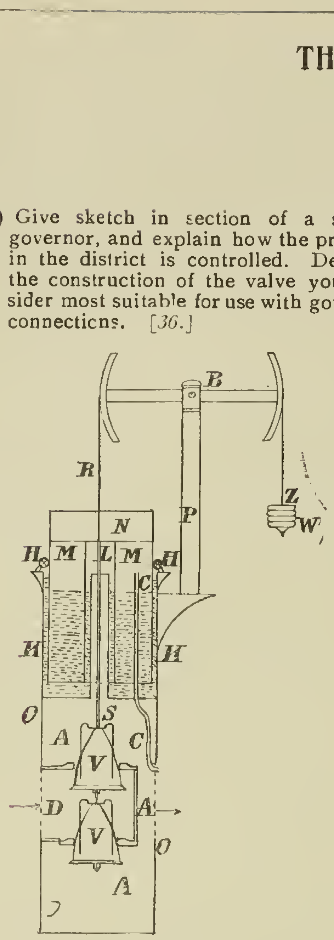


Fig. 9.

In the sketch (fig. 9) of a station governor, O is a cast-iron case which is divided into two compartments D and A—the inlet and outlet respectively. The valves V V are of the parabolic plug type, which, when raised or lowered, either cut off, or put into communication, the inlet and outlet chambers. Above this bottom chamber is a cast-iron tank K, containing water. In this tank floats a tinned iron bell M, into which leads the pipe C, which is open at both ends; the other end being in the outlet chamber—thus placing the interior of the bell and the outlet chamber into gas communication. Inside the large bell M is a smaller one L, to the top and in the centre of which is attached the rod S for supporting the parabolic valves. This inner bell is employed to prevent the gas—just as it issues past the valve, or from a higher to a lower pressure—having direct effect on the whole of the bell top. The wheels H, on the edge of the tank, are to guide the bell M, so that it moves in a vertical plane only. To the top of the bell M, on the outside, is attached a chain R, which is fastened to one end of the balance arm B; the other end having weights W suspended therefrom to balance the weight of the bell. The action of the governor is as follows: Weights are taken off the rod Z, or water is run into the tank N on top of the bell, which consequently lowers, the plug-valves V V lowering simultaneously, and so allowing gas to pass from the inlet chamber D between the parabolic valves and their seatings to the outlet chamber. When a quantity of water has been run into the weighting tank N to allow a certain pressure on the outlet, this is controlled by the pipe C thus: If the pressure on the outlet is increasing owing to smaller consumption, it is communicated to the large bell by the pipe C. This increased pressure raises the bell, thus drawing up the parabolic plugs and diminishing the size of the gas-ways. When decreased consumption takes place, the reverse happens; the lower pressure prevailing in the outlet chamber is likewise communicated to the bell, which falls—on account of the pressure not being able to sustain it at its former height—and with it the parabolic valves, thus increasing the size of the gas-ways, allowing more gas to pass, till the original pressure is regained. It will thus be seen that it is a case of the forces acting on the bell keeping it in equilibrium.

The most suitable valve is the internal rack-and-worm valve, shown in fig. 10. It consists of an outer case divided into two parts A and B, the internal faces of the outer case, over which the doors slide, are machined perfectly true, and the upper edge is left sharp, for the purpose

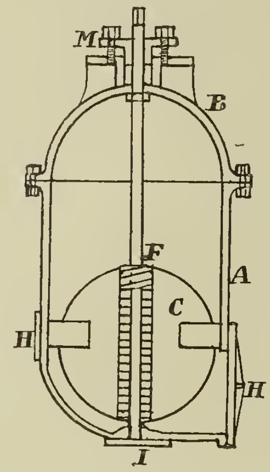


Fig. 10.

of clearing away tarry matter or grit. There are two doors or slides C, which are forced apart by springs. The rack is on each of the inner sides of the doors, and the worm F and spindle work between them. H H are doors for cleaning, &c. The valve spindle F works through a gland M, and rests in the footstep I, which, if the spindle sticks, can be removed for re-adjustment. The top casing B can be removed for cleaning and repairing. Mistakes are avoided if these valves are surmounted with suitable indicators for showing at a glance whether "open" or "shut."

8. (B) What are the considerations that determine the employment of district governors? Explain, by the aid of a sketch in sectional elevation, the use of a differential district governor. [36.]

The considerations that determine the use of district governors are: (1) The district is one of greatly varying altitudes. (2) It has not been advisable or convenient to govern the high districts separately. (3) Such governors avoid unnecessary pressure to some extent and reduce leakage. Fig. 11 shows a Peebles district governor, which consists of a cast-iron case M with flanged top cover F, divided into two chambers T (inlet) and L (outlet) by the partition K, which extends nearly to the bottom of the casting. The bottom half of the casting is

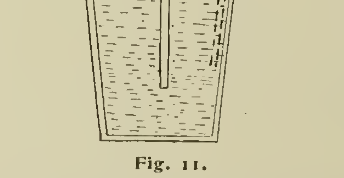


Fig. 11.

used as a syphon pot to collect products of condensation, which are pumped out periodically by means of the pipe Z. The valve A, which is of tinned iron, is hollow and cylindrical in shape. In the side are cut a series of holes B in the shape of parabola, which are irregular in height. The spindle R, attached to the top of the valve, passes through a stuffing-box in the top of the main casting into a small upper compartment, where a saddle is passed over it to carry weights. This compartment has a loose fitting lid D to keep out dirt, &c.

The action of the governor is as follows: The gas passes into the inlet chamber and under the hollow valve A. The pressure of the gas lifts the valve, allowing the gas to pass through the parabolic apertures in the side of the valve to the outlet. Some of these apertures, being nearly the full length of the side of the valve, allow the pressure of gas to be reduced very low without entirely cutting off the supply. A district governor is differential in its action—*i.e.*, if weights are put on to reduce the pressure on the outlet by (say) 1 inch, no matter what the pressure is on the inlet it will be 1 inch less on the outlet, provided it does not fall to 1 inch or below on the inlet, in which case the governor would cut off the supply completely.

9. (A) State the best form of movable pendant for (*a*) drawing-room, (*b*) workman's bench. Give in each case the points of construction and conditions in use that determine your preference for the type selected. [36.]

(*a*) The accompanying sketch (fig. 12) illustrates a suitable form of movable pendant known as the "Surprise." To the ball-and-

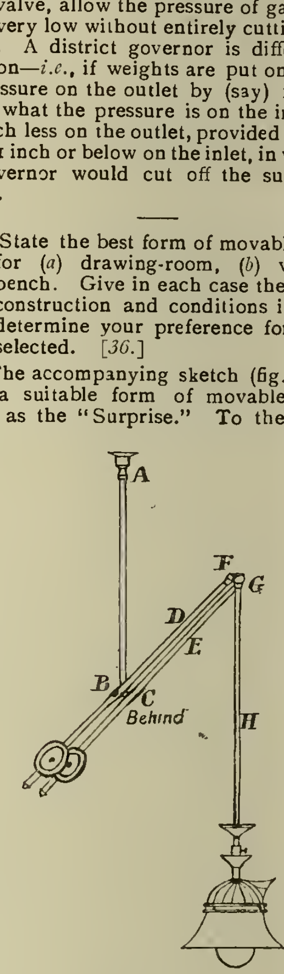


Fig. 12.

socket joint A is attached an arm as shown. By means of the swivels B and C, the cross arms D and E are free to move in a partially circular direction in the vertical sphere, also in a complete circle in the horizontal sphere. By means of the swivels F and G, the vertical arm H is fixed; the latter carrying the burner, preferably inverted. Balance weights are attached to the arms D and E, to counteract the weight caused by the burner. The advantages are:

(1) Simple in action and artistic in design.
(2) No water-slide required.
(3) Can be raised, lowered, or moved in a horizontal circle to suit requirements.
(4) Easy of manipulation.

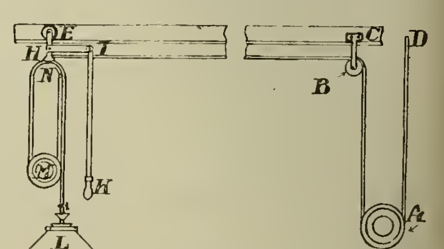


Fig. 13.

(*b*) Fig. 13 illustrates a type of movable pendant suitable for a workman's bench. E C is a piece of T-iron, which can be made of a length to suit type of bench. The wheel E, and one on the other side of the iron, not shown, run on the flange of the T-iron, and are moved backwards and forwards by the handle K. This handle is hinged at I to the piece H I, which is bolted to the wheel-guide. Screwed into the bottom of the wheel-guide at N is a Hanwell rise-and-fall pendant M, carrying an inverted burner L. A connection is made through the wheel-guide N to the metallic tube which passes

over the pulley B, the support of which is fixed at C. The tube passes under pulley A, and is fastened to a support in the wall or ceiling D, and is there connected to the gas supply. Thus it will be seen that the pendant is free to move up and down over the bench by means of the Hanwell arrangement, and also backwards and forwards along the bench as the weight A rises or falls.

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9. (B) Describe two forms of anti-vibrator suitable for street lanterns. State which you prefer, and why. In what way may india-rubber tube connections become disadvantageous? [*36.*]

Figs. 14 and 15 indicate two forms of anti-vibrators suitable for street-lanterns. Fig. 14 (A.V.I.L. Company) consists of a light wire frame C having a flat base D, to which the burner is secured by means of a screwed collar. The frame and burner are freely suspended by a hooked rod B to a coiled spring A, enclosed in a sheath. The whole arrangement is carried by a hook fastened to a light plate across the top of the lantern. The connection at D is made by rubber tube to the lamp cock.

Fig. 14.

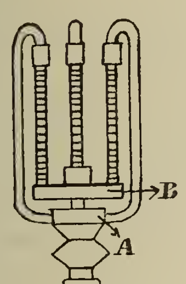

Fig. 15.

In fig. 15 (Helps') the base A fits upon a plug, which is in turn secured to the lamp cock; the joint being made gas-tight. From the top part of A, three rigid vertical arms ascend. The upper portion of these arms are bent over and attached to three short lengths of flexible metallic tube, the lower ends of which carry a brass body B, to which the burner is fixed. In this type the metallic tubes permit horizontal and vertical movement without any shock being felt on the mantle. This anti-vibrator is easily removed and cleaned, and there are no rubber tube connections.

Rubber tube is disadvantageous, as it is liable to crack with exposure—leakage ensuing. Various constituents of the gas act chemically on rubber, with very disastrous results. It is a medium for naphthalene deposits, through benzolized gas setting up chemical action with rubber. The type of anti-vibrator therefore shown in fig. 15 is preferable, unless with fig. 14 Curtis's patent attachment is used instead of rubber tubing.

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10. (A) Explain the constructional features and advantages in use of any two of the following: (*a*) Macfie's governor meter; (*b*) Thorpe's discount meter; (*c*) Valon's stop meter. [*36.*]

(*a*) This apparatus has a governor as an integral part of the meter. It is fitted in the upper compartment of the meter—*i.e.*, in the

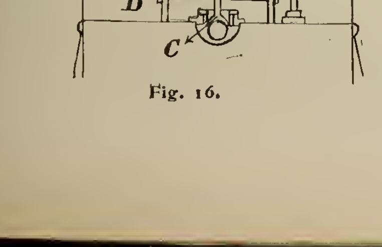

Fig. 16.

gas-inlet tube. The governor, fig. 16, consists of a flexible diaphragm D, a cone valve C, with adjustable weight H. Passing through the outer case of the meter is a key K, attached to a screwed lever G, by means of which the adjustable weight H is caused to act upon the governor. The weight can be altered by turning the key in one direction or the other. The latter is fitted with a scale representing tenths of an inch pressure. By using this combined instrument a separate governor is not required.

(*b*) Thorpe's discount meter is constructed on similar lines to an anemometer. It consists of an outer cylindrical case with inlet and outlet pipes arranged as fig. 17. The gas is caused to

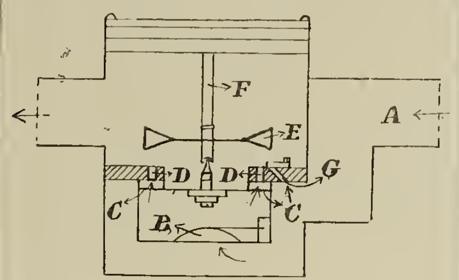

Fig. 17.

impinge on a series of vanes set at an angle of 45° to the horizontal. These are in the form of a wheel, and attached to a central spindle, which revolves in glass bearings. The spindle is connected by means of suitable cogwheels to the registering mechanism. The operation is as follows: The gas passes from the inlet A through the metal flap-valve B, and then through the fine wire gauze C. This spreads the gas, which then flows through the ports D, of which there are four. These ports break up the stream of gas and distribute it evenly upon the vanes of the fan E, which is placed immediately above them. The revolutions of the fan are transmitted to the registering mechanism by means of the spindle F. A small hole G, which is in direct communication with the inlet gas, allows of small quantities of gas, which are too small in volume to lift the flap-valve, to pass to the fan.

The advantages are that it takes up about one-tenth of the space of an ordinary meter of the same capacity, is cheaper, and is especially suitable for differential prices. It is not authorized under the Sales of Gas Act, however, because it is not guaranteed to register correctly when passing less than 4 to 5 per cent. of its total capacity.

(*c*) This appliance is really a form of prepayment meter; but instead of coins being placed in the meter to operate the mechanism for opening the valve, the latter is done by the gas inspector. Additional mechanism is attached to, and geared into, the index wheels of an ordinary meter whereby a valve, which is in the gas inlet passage, is operated. When a quantity of gas has been prepaid, the valve is opened, and as the prepaid quantity is consumed, the valve automatically closes. The shaft A is connected,

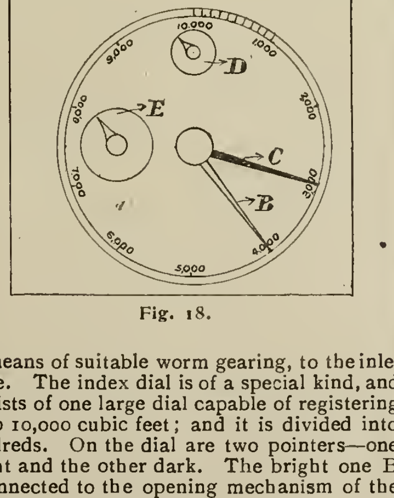

Fig. 18.

by means of suitable worm gearing, to the inlet valve. The index dial is of a special kind, and consists of one large dial capable of registering up to 10,000 cubic feet; and it is divided into hundreds. On the dial are two pointers—one bright and the other dark. The bright one B is connected to the opening mechanism of the inlet valve, and is operated by the inspector. This shows the amount of gas prepaid. The dark pointer C is connected with the closing mechanism of the inlet valve, and works automatically. This pointer registers the consumption of gas. Contained within the large dial are two subsidiary dials, D and E. D registers units; while E continues the registration of the large dial, showing hundreds of thousands. Fig. 18 shows that 4000 cubic feet of gas has been prepaid, and that 3000 feet has been consumed. When a quantity of gas is required, the inspector is sent for, and he rotates the shaft A by means of a special key until the required amount is indicated by the bright pointer B; this being paid for by the consumer. As the gas is consumed, the dark pointer C approaches B; thus indicating to the consumer how much gas he still has to burn before sending for the inspector again. The shaft A is enclosed in a suitable socket, to prevent it being tampered with. This type of meter can be used with especial advantage in lock-up shops and in seaside boarding houses, where the tenants are constantly changing.

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10 (B). What means are employed in wet meters for preventing "slow" registration? Give one method of maintaining an unvarying water line in wet meters. [*36.*]

Slow registration in wet meters is prevented, in most cases, by keeping the water up to the proper level. This is usually done by periodical inspection and watering. A device for preventing slow registration is known as the Warner and Cowan drum. In fig. 19, A is the ordinary meter

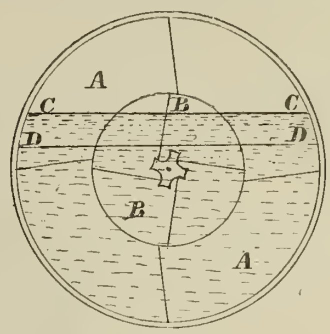


Fig. 19.

drum, and B is an inner drum, which is about half as deep as the large drum. The partitions in the inner drum are fixed in an opposite direction to those in the large drum. In the large drum gas is passed from front to back, while any gas in the inner drum is passed from back to front. The operation is as follows: The periphery of the inner drum rises a little above the high-water line CC; and it is of such a capacity that it exactly divides, with the large drum, the variable portions between the high and low water line level DD. If the water level falls below the true line, the capacity of the large drum is increased, and more gas is passed than will be registered. This increase, however, is equalled by the increased capacity of the corresponding chamber in the small drum, and, consequently, an exactly similar quantity of gas is passed back to the front of the meter to be re-registered.

There are various devices for maintaining an unvarying water-line. Fig. 20 shows the one patented by Messrs. Sanders and Donovan. B is a compensating float made of tin plates, half-moon in shape, and carries a stop-valve A. The float works entirely independent of the ordinary action of the meter; being placed in the front case, and revolving on the spindle D. When

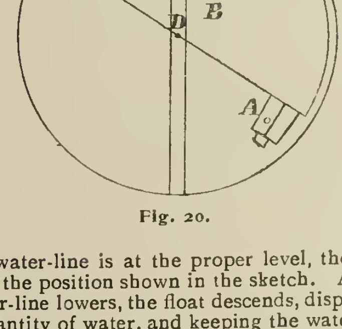


Fig. 20.

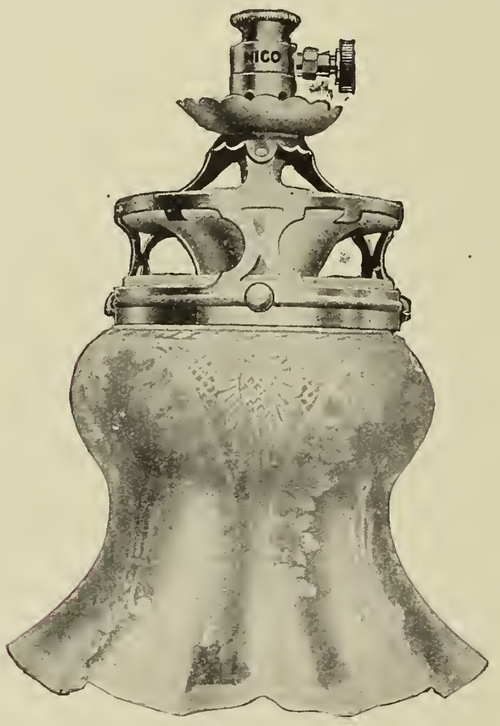
the water-line is at the proper level, the float is in the position shown in the sketch. As the water-line lowers, the float descends, displacing a quantity of water, and keeping the water-line in the registering chamber at the proper level. Should the water-line get so low as to make this impossible, the float rotates, so that the valve A presses against its seating C, which is the inlet, and shuts off the supply of gas.

THE "NICO" INTERMEDIATE BURNER.

The Size for General Domestic Use.

From all that can be gathered, there is no doubt that the coming lighting season will see a distinct move in the adoption of an intermediate size of inverted gas-burner for domestic purposes. The manufacturers recognize this, and the factors are not behind them in appreciation of the fact. The tendency of public fancy and requirement in such a matter is readily detected by those with their eyes on the market. Nothing short of marvellous are the rapid strides that the inverted incandescent gas-burner has made in supplanting the upright form of burner; and it is a movement that will continue, and at accelerated pace, with the expanson of the range in sizes of the inverted type. Time, too, is cultivating knowledge among householders as to their requirements in lighting. The large inverted burner, for several reasons, is found to be too big for general domestic use; and in dining-rooms, morning-rooms, and so forth, the bijou burner is rather too small. For drawing rooms, halls, landings, &c., the latter is eminently suitable, both on artistic and economical grounds; but, in other situations in the house, it is too small, while the ordinary form is too large, and can with advantage be reduced. The intermediate size of inverted burner meets the need admirably; and we have little doubt that this will rapidly become the standard form of burner for ordinary domestic use.

To the fore in all matters relating to inverted burners are the New Inverted Incandescent Gas-Lamp Company, Limited; and they are in the market betimes for the coming season with an intermediate form of their popular "Nico" burner, the merits of which, from the point of view of efficiency and in certain other respects, in our opinion transcend even the best—and the best has been good—that the Company have before produced. Efforts on the part of the Company to construct an intermediate burner



The New "Nico" Intermediate Burner (Half Size).

that would maintain their reputation were actually made some five years ago, when there was work on a model which we have inspected with interest at the present stage of success. Five years ago knowledge of inverted burner construction was not what it is to-day; and so far as the work then proceeded, results could only be obtained that were little better than those realized by the well-known bijou burner. In consequence, for a time, the experiments were abandoned. But lately they have been resumed, with the view of producing a burner modelled upon the same lines as the No. 4 "Nico" burner, with mixing chamber. The result is one that, in point of view of efficiency and neatness of structure (which enables far more artistic globes to be used) can be described as the most successful inverted burner for domestic lighting that has ever been placed on the market by the Company. The burner is fitted with both gas and air regulators; and so it can be easily adjusted to suit all compositions and pressures of gas. The adjustment is exceedingly simple; and therefore a high efficiency can be secured under all supply conditions. Under quite low pressures, the results are distinctly better than from any of the other burners that the Company have previously introduced. It will be observed from the illustration that the burner is constructed with the white porcelain cone associated with all the "Nico" inverted burners. Apart from the original advantages of this cone, as time passes, its beneficial protection is also being highly appreciated—in view of the longevity the burner in consequence enjoys, and the ease with which the whole of the burner can be kept clean. Speaking of the cone, there is noticeable a decided improvement in the additional space, in comparison with the bijou form of burner, that is given between the cone and the globe-supporting fitting, for the escape of the heat, to the current of which the head of the cone gives lateral direction away from the metal work above. Through this additional space, the risk of breakage of glassware is reduced to the minimum.

As to results. Using the 16-candle gas of the Gaslight and Coke Company, in which there is a proportion of carburetted water gas, the illuminating power is equal to 55 candles, for a consumption of $2\frac{1}{4}$ cubic feet. Inspecting the flames of the burners, they were of a type that assured of perfect combustion; and the splendid incandescence over the whole surface of several mantles examined certified that there could be little or nothing amiss in respect of combustion. But nothing more need be said on this head after showing a candle power and a gas consumption representing an efficiency, at district pressure, of 24 candles per cubic foot of gas. One other point in this connection. In the tests, by varying the proportions of gas and air, attempts were made to get the burner to light-back; but in this there was complete failure.

Now for two or three reasons why an intermediate burner is certain to become popular for domestic purposes. Take a three-light dining-room pendant. It is not an infrequent occurrence to find three large inverted burners suspended from it, and only one alight. The three burners themselves look much too heavy for the pendant; and the use of only one of the burners looks incongruous, while with smaller burners of the intermediate type a much more pleasing effect and a better distribution of the light are realized. The intermediate burner, too, lends itself to a new range of artistic glassware—a sample of which (half size) is shown in the illustration. The Company have got out some excellent designs in new shaped globes for the burner; and whether on pendants or brackets, the most dilettante taste will be gratified by them. One further point. The price—which is an important factor—at which the new burner is being placed on the market is one that will be popular, and is bound to assist in achieving a large measure of success.

INSTITUTION OF CIVIL ENGINEERS.

Regulations as to Professional Conduct and Membership.

Proposals have just been submitted by the Council of the Institution of Civil Engineers to the members for amending the bye-laws in some important respects, particularly in regard to professional conduct and the qualifications for election as members.

The suggested new section dealing with professional conduct sets out in seven clauses what the professional engineer shall not be allowed to do without being guilty of professional misconduct. He shall not accept any trade commission; nor, while acting in a professional capacity, be a director of, or shareholder in, nor have any financial interest in, any business with which he may have dealings. He must not receive any royalty or commission on any patented article used in the work he is carrying out. Further, he shall not improperly solicit professional work; and when in practice or intending to practise, he shall not advertise for professional employment. It is obvious that some of these proposals merely voice what is already well understood as being contrary to professional etiquette, and also discountenance conduct which the Legislature has recently enacted shall be considered criminal —that is, in regard to corrupt commissions. At the same time, it is no doubt well for the premier engineering institution to state definitely in their bye-laws what shall be regarded as professional misconduct. Any offender will, on due proof, be liable to expulsion, or to other pains and penalties.

Several alterations are proposed to be made in the qualifications requisite for election as members or associate members. As regards full membership, the applicant must be more than 33 years of age—not 30, as it was before. In addition to being an associate member, or having fulfilled the conditions for such, he must have been for five years in a position of primary responsibility on important work, and be so engaged at the time of application. Or, alternatively, he must have been trained as a civil engineer and have had fifteen years' primary responsibility for work. The age for associate membership remains the same as before—namely, more than 25 years. He shall have passed the studentship and the associate membership examinations of the Institution, or any exempting examination. The substitution of a qualifying thesis or paper is done away with. In addition, the applicant (*a*) shall have been regularly trained as a pupil for three years, and have had two additional years' experience; or (*b*) shall have obtained a degree in an engineering college, and have had two years' training as pupil; or (*c*) shall have followed a three years' course in an engineering college, and have had four years' experience as assistant under a corporate member of the Institution; or (*d*) shall have had seven years' experience both in office and works as assistant to a corporate member.

Finally, there are special provisions and exemptions for technical teachers and students, and other proposals which here need not be mentioned. The general effect seems to be a stiffening-up of the qualifications, both educational and practical, necessary for admission into the Institution of Civil Engineers.

THE PUBLIC LIGHTING OF THE CITY OF LONDON.

Report of the Deputation to Continental Cities.

As already recorded in the "JOURNAL" a deputation of the Streets Committee of the Corporation of London were appointed, in October last, to visit certain cities on the Continent for the purpose of inspecting the various systems of public lighting thereat. The deputation, which consisted of the Chairman (Mr. Charles A. Teuten), Mr. Deputy Turner, and Messrs. John Stopher, Josiah Gunton, and G. Gordon Stanham, left London on the 18th of March, and returned on the 1st of April. At the meeting of the Court of Common Council on the 1st inst., the Committee submitted the report of the deputation, together with particulars of the different systems of lighting inspected; and without offering any opinion on the report or the suggestions that it contained, they asked authority to print and circulate it for the information of the Court. This authority was granted, and the report has since been issued. In view of its importance, we give it in full.

We, the deputation appointed to visit certain Continental cities for the purpose of inspecting the various systems of public lighting, beg to report that we visited Brussels, Cologne, Düsseldorf, Berlin, Dresden, Vienna, Munich, and Paris. We submit particulars of the different systems of lighting which we inspected, from which it will be seen that in every city gas as well as electricity is used. We also append particulars of the lighting in the City of London.

Brussels.—The main thoroughfares, squares, and market places are lighted by means of electric arc lamps, with an ordinary incandescent gas-burner on each side. The arc lamps are turned off at midnight, after which time the lighting is supplied by gas. The side-streets are lit with incandescent gas.

Cologne.—The important streets of the city are lit by centrally hung electric arc and flame lamps, with lowering gear, the open spaces by a combination of electricity and gas, and the minor streets mainly by incandescent gas-lamps upon standards.

Düsseldorf.—This city is lit in a somewhat similar manner to Cologne, arc lamps centrally hung and upon standards, and by incandescent gas.

Berlin.—The general arrangement for lighting is by means of electric arc lamps, centrally hung and upon standards, electric glow lamps, and high-pressure incandescent gas-lamps with inverted mantles.

Dresden.—Electric arc lamps of the open and flame type are used in this city; a considerable number being suspended across the centre of the streets, with side lowering gear. Electric glow lamps are also used. The side streets are lit with low-pressure incandescent gas-lamps. The electric arc lamps are switched off at midnight, leaving incandescent gas lighting only.

Vienna.—Electric arc lamps upon standards with incandescent gas-lamps fixed upon brackets below, together with low-pressure incandescent gas-lamps fitted with upright and inverted mantles.

Munich.—Electric arc lamps centrally hung and upon standards, also electric glow lamps and low-pressure incandescent gas-lamps.

Paris.—Electric arc lamps upon standards, and low-pressure incandescent gas-lamps.

Having very carefully considered the various systems, we are of opinion that the public lighting in the City of London can be materially improved; and we have come to the following

CONCLUSIONS.

(1) That, wherever possible, streets should be lighted by means of centrally hung lamps, with lowering gear. This we think particularly important in the City of London, where the number of obstructions upon the footways in the form of lamp-posts, bins, letter-boxes, &c., is so large.

(2) That open spaces should be lighted by means of lamps upon standards, fitted with lowering gear.

(3) That high-pressure incandescent gas-lamps with inverted burners should be adopted as the illuminant; but where gas is impracticable, electricity with open arc and flame arc lamps should be installed.

We think, however, before suggesting any drastic alterations in the general lighting of the City, that the Streets Committee should be authorized to arrange for some further experimental lighting of the City thoroughfares; and we recommend accordingly, and that our report, with the particulars of our recent inspection, be in the meantime printed and circulated for the information of the Court.

In conclusion, we desire to place on record our appreciation of the facilities afforded by the various Municipalities for our inspection of their systems of lighting, and for the kindness and hospitality we received.

PUBLIC LIGHTING IN CONTINENTAL CITIES.

Brussels.

The municipal district of Brussels includes the old town (enclosed by the outer boulevards) and the new harbour works. Outside this area there are ten self-governing suburbs. The city proper contains about 270,000 inhabitants, and has an area of about one-and-a-half square miles. The deputation inspected the lighting under the guidance of the Principal Electrician and other officials. In the suburbs, various contractors undertake the work; the principal districts being lighted by the Imperial Continental Gas Association.

The main thoroughfares, squares, and markets are lit by means of electric arc lamps, with an ordinary incandescent gas-burner on either side. The arc lamps are turned off at midnight, after which time the lighting is supplied by gas. The side streets are illuminated by incandescent gas-burners.

The total number of electric arc lamps in Brussels is 238, supplied by direct current, consuming energy at the rate of 440 watts, and fixed upon columns. The distance (not diagonal) between the open lamps is 98 to 115 feet; the average height of the lamps being about 20 feet. The width of the streets in which open lamps are used varies from 82 to 98 feet. The cost per lamp per annum (half-night only), including interest, depreciation, and all other charges, is £14 9s. 7d.

There are only two centrally-suspended electric arc lamps; and these are fixed in the Grand Place, from the Hotel de Ville across the Market Place (the lamps taking 1100 watts each), at an altitude of about 70 feet—the width of the Market Place being about 200 feet. The lowering gear in connection with the lamps is placed within the Hotel de Ville. No accidents have been reported to have occurred from this method of attachment.

Electric glow lamps are not used in the public streets of Brussels.

Incandescent gas lighting is largely used in the city, the lamps generally being fixed upon standards; but brackets are used in the smaller streets. The type of lamp most prevalent is a conical lamp with two upright burners, also inverted burners in groups of three or five. These lamps consume from 3½ to 8½ cubic feet of gas per hour, according to the burner; the illuminating power obtained by the upright burners being equal to 55 candles, and of the inverted burners 133-candle power. The height of the lamps above the roadway, measured from the burner, is from 11½ to 14¾ feet.

There are no public high-pressure incandescent gas-lamps in Brussels.

The deputation were informed that the lighting of the city, both by gas and electricity, is carried out by the Municipal Authorities without the intervention of a contractor.

Cologne.

Cologne, the largest city in the Rhenish Province of Prussia, is situated on the left bank of the Rhine, and has an area of about 43 square miles, with a population of about 428,000. The deputation inspected the lighting under the guidance of the Chief Inspector of the Electricity Works and other officials.

The important streets of the city are lighted by centrally-hung electric lamps; the open spaces by a combination of electricity and gas, as in Brussels; and the minor streets mainly by incandescent gas-lamps upon standards.

The total number of electric arc lamps in Cologne is 426, supplied by alternating current; both open and flame lamps being used. One-half of the lamps are centrally hung; the others being fixed upon standards. The distance between the open lamps is 88 to 115 feet, and between the flame lamps 121 to 148 feet. The lamps are fixed at a height of from 26 to 33 feet in streets from 23 to 148 feet wide. The cost per lamp per annum, including interest on capital outlay, depreciation, and all other charges, is for open lamps £11 5s. 6d. each; and for flame lamps, £9 6s. 3d. each.

The centrally suspended arc lamps are fixed about 30 feet above the roadway, 110 feet apart, and give a light equal to about 1300 candles each. The apparatus used for lowering the lamps is contained in a box 12 inches high, and 8 inches wide, attached to the houses about 4 feet from the pavement level. By a simple arrangement, the lamps are drawn aside over the pavement and lowered for trimming, &c.; and on being replaced are lighted by automatic contact with the main wire. Owing to the daily examination during the trimming of the lamps, the danger to the public from defective wires is reduced to a minimum; only one accident having been reported since the lamps were fixed.

There are 117 electric glow lamps used in the streets, of which 30 are carbon filament lamps and 87 metal filament lamps. These carbon filament lamps are of 14-candle power, and take about 50 watts each. The metal filament lamps are 28-candle power, and take 32 watts. The lamps are fixed in groups upon columns

about 100 feet apart, at an average height of 11 ft. 6 in. The cost per lamp per annum, including interest on capital expenditure, depreciation, and all other charges, is for carbon filament lamps £2 14s.; for metal filament lamps, £2 4s. 2d.

There are only ten high-pressure gas-lamps in the streets of Cologne; and these are supplied direct from a compressing plant, and give a light of from 460 to 1080 candle power. But as they were stated to be purely experimental, no definite information could be obtained as to their value.

Incandescent gas lighting (low pressure) is largely used in the city. There are 192 miles of side streets in lighting; the lanterns being fitted with upright Welsbach mantles. The consumption of gas is about 4¼ cubic feet per hour, giving a light of 63 to 72 candle power; the average height of the lamps above the roadway, measuring from the burner, being about 11 ft. 6 in. The lamps are placed about 65 to 98 feet apart diagonally, and are fixed partly on central columns and partly on wall-brackets. The cost per annum, including interest on capital expenditure, depreciation, and all other charges, is for lighting up to midnight £2 11s. 8d.; all night, £3 5s. 3d.

The incandescent gas-lamps (low pressure), although fixed in nearly all the streets of Cologne, are only used in the main streets after midnight, or when the electric light fails.

The deputation were informed that the Municipality, who have control of the lighting and of the water-works, make a profit on these of about £150,000 a year in relief of the rates. Electricity is also supplied by the Municipality. The city is encircled by a ring street, which is lit by electricity, and during the summer months, when trees are in full leaf, incandescent gas lighting is also used.

Düsseldorf.

Düsseldorf, the capital of the district of that name, lies on the right bank of the Rhine at the influx of the Düsselbach. It has an area of about 19 square miles, with a population of about 252,000. The deputation inspected the lighting under the guidance of the Inspector of Electricity and other officials. The city is lighted in a somewhat similar manner to Cologne—arc lamps on standards, centrally hung, supplemented by incandescent gas.

The total number of electric arc lamps in Düsseldorf is 334, of which 24 are supplied by alternating current, and 310 by direct current. Open and flame lamps are used, each lamp taking about 650 watts. Of these lamps, 149 are fixed upon standards and brackets; centrally suspended lamps to the number of 185 being used in narrow streets—the lowering gear being fixed to the sides of the houses, in the same manner as in Cologne. Owing to the daily systematic examination during the trimming of the lamps, danger from defective wires is reduced to a minimum.

The average distance between open lamps is about 164 feet, and between flame lamps 197 to 394 feet. The lamps give a light of about 2000-candle power, and are fixed at a height of about 30 feet in streets from 33 to 98 feet in width. One-half of the lamps are extinguished at midnight. The total cost per lamp per annum, including interest on capital outlay, depreciation, and all other charges, is £17 13s.

Electric glow lamps are also used. There are 120 carbon filament lamps of 14 and 22 candle power, taking about 50 and 75 watts respectively; and 111 metal filament lamps of 22 and 90 candle power, taking 25 and 100 watts respectively.

Incandescent gas lighting is used generally in the streets and for ornamental lighting; and the lights are of the upright incandescent type, consuming about 4·4 cubic feet per hour, with an illuminating power of 72½ candles. The lamps are fixed about 10 ft. 6 in. above the roadway. The cost per annum, including interest on capital expenditure, depreciation, and all other charges, is up to midnight £1 14s.; all night, £3 8s. 3d.

There are no public high-pressure gas-lamps in Düsseldorf; but experiments with low-pressure inverted incandescent lamps are being carried out.

Gas and electricity are made and supplied by the Municipality.

Berlin.

Berlin, the capital of Prussia, contains upwards of 3,000,000 inhabitants, and thus occupies the third place among the cities of Europe. The deputation were received by Dr. Kirschener, the Chief Burgomaster of Berlin, and inspected the lighting under the guidance of the Manager of the Berlin Gas-Works, the City Gas Examiner and Chief of the Chemical Laboratory, and the Chief Engineer of Public Lighting. Gas is manufactured by the Municipality; but electricity is purchased in bulk from a private Company.

The total number of electric arc lamps (open and flame) used in Berlin is 864, supplied by direct current. Of these lamps 664 are fixed upon standards, and 200 are suspended across the streets, centrally hung. The distance between the open lamps is from 100 to 130 feet, and 98 feet between the flame lamps. The open and flame lamps are fixed at heights of 26 to 31 feet; a few flame lamps being 52 feet high. One half of the lamps are extinguished at midnight.

There are 212 electric glow lamps used in the city; 177 being of the Nernst type, 14 carbon filament lamps, and 21 metal filament lamps. The carbon filament lamps give a light of 14 candles, and take 57 watts per lamp; the metal filament lamps, 440-candle power, and take 440 watts per lamp.

High-pressure gas lighting is very largely and effectively used in Berlin; 25 miles of streets being lit by 1531 lamps fitted with upright and inverted burners, two and three burners in each lantern. They are supplied direct from four separate compressing plants at a pressure of about 53 to 78 inches (water-gauge). The newest type of lamps—viz., the Graetzin high-pressure inverted lamp, fitted with three burners per lantern, gives an illuminating value of over 4000 candles. Two burners are extinguished at midnight. The distance apart of these high-pressure lamps is from 90 to 100 feet; and the average height of the lamps above the roadway, measured from the burner, is about 19 feet.

Gas manufactured by the Municipality is of 12-candle power, unenriched; but tested by the "Metropolitan No. 2" burner, a light equal to 14 or 15 candle power is obtained. The price of gas was stated to be 1s. 4½d. per 1000 cubic feet for public lighting purposes. The calorific value (heating power) of this gas is 540 B.Th.U., or 135 calories (gross). This compares favourably with the proposed calorific standard for London gas—viz., 14 candles, 500 B.Th.U., or 125 calories (gross)—as inserted in the Gaslight and Coke Company's Bill before Parliament this session.

The deputation were informed that the Berlin authorities have decided to spend seven million marks (£350,000) in installing the latest patterns of high-pressure gas-lamps with inverted burners, in lieu of the existing gas and electric lamps. Expenditure in this direction has been going on for two years at the rate of a million marks (£50,000) a year, and will be continued at the same rate for the next five years. The lamps used are graded according to the importance of the thoroughfares—at junctions of main streets, lamps of 4000-candle power; in main thoroughfares, lamps of 2000-candle power; and in other streets, lamps of 1000, 600, 400, and 200 candle power, the 400 and 200 candle power lamps being on low pressure. So far as gas is concerned, four-fifths of the city is lighted by the Municipal Authority, and the remaining one-fifth by the Imperial Continental Gas Association. In some streets where the Municipal Authority and Association meet, the latter are putting in the same kind of burner as the former.

Incandescent gas lighting (low pressure) is used for the side streets; there being about 466 miles of streets lighted by 3000 upright burners and 2600 inverted burner lamps. The upright burners consume about 4¼ cubic feet, and give 63 to 70 candle power light; and the inverted burners consume about 3½ cubic feet, and give about 100 candle power light. The lamps are fixed 82 to 92 feet apart on the diagonal, at a height above the roadway, measured from the burner, of 11 ft. 6 in. to 14 ft. 6 in.

At the present time, the principal streets are lighted with high-pressure inverted incandescent gas-lamps of the following type:

Lamps Consuming Cubic Feet of Gas per Hour.	Giving a Light equal to about	
21·2	636 candles	(Upright burner).
28·26	1000 ,,	(,, and single burner).
42·4	1364 ,,	(,, burner).
42·4	1540 ,,	(Inverted, 2 burners).
53·0	1636 ,,	(Upright, 3 ,,).
84·8	3367 ,,	(Inverted, 3 ,,).
*84·8	4364 to 4550 ,,	(,, 3 ,,).

* This is the newest type of the Graetzin lamp, two burners of which are extinguished at midnight, the upkeep not exceeding that of the 3367-candle power lamps.

In future, incandescent gas lighting only will be used in Berlin.

The Graetzin high-pressure gas-lamp, named after the inventor, Herr Graetz, of Berlin, is a three-burner inverted lamp, made to connect on to a compressing plant at about 54 to 67 inches pressure (water-gauge), or 4 to 5 inches of mercury. It uses three of the large size inverted mantles, and its estimated candle power is about 4800 to 5000 German, or 4364 to 4555 English candles—single burners giving about 1400 to 1500 English candles, according to the Berlin photometrical tests. The gas consumption per hour of a three-burner lamp is about 84·8 cubic feet—*i.e.*, 28·2 cubic feet per burner—therefore the approximate lighting efficiency is about 51 to 53½ candles per cubic foot of gas consumed. The efficiency claimed is stated to be from 45 to 55 candles per foot of gas. The lamp is so made that two burners can be extinguished at midnight or any other arranged time, leaving one alight for the remainder of the night. Its dimensions over all are 3 ft. 9 in. by 2 ft. 2 in. Its weight is 86 lbs.

It is stated the mantles at the present time are in use for about nine days. It is, however, probable that the life of the mantle will be lengthened. One attendant serves about fifty lamps—that is, he has to clean them, replace mantles, &c. The extinguishing and lighting are carried out automatically by change of pressure. After midnight, however, it is done by hand.

The streets will be divided into classes: First-class streets will have inverted high-pressure gas-lamps of 4000-candle power. Second-class streets will have inverted high-pressure gas-lamps of 2000-candle power. Third-class streets will have inverted high-pressure gas-lamps of 1000-candle power. Fourth-class streets will have low-pressure inverted lamps of 600-candle power, each candelabra having two lamps with three burners each. Fifth-class streets receive low-pressure inverted lamps of 400-candle power, each candelabra having two lamps with two burners each. Sixth-class streets receive low-pressure inverted lamps of 200-candle power, each candelabra having one lamp of two burners. The candelabra still existing with three, two, and one upright mantles are being used up, and are gradually disappearing, giving place to inverted burner lamps.

NAME OF CITY.	Total Number of Lamps.	Number supplied by		Type of Lamp.			Watts used in			Lamp Supports.					Average distance in feet (not diagonal) between		Average height (in feet) of		Average width of Streets (in feet) with		Minimum Illumination (in Candle-feet) on or near the ground		Average Illumination (in Candle-feet) on or near the ground.		Hours of Lighting per annum.	Cost per Lamp per annum, including Interest, Depreciation and all other charges.		Municipal or Company.	Remarks.
		Alt. Ct.	Direct Ct.	Open.	Enclosed.	Flame.	Open.	Enclosed.	Flame.	Central Posts.	Side Posts.	Central Suspension with Lowering Gear.	Central Suspension without Lowering Gear.	Brackets.	Open Lamps.	Flame Lamps.	Open Lamps.	Flame Lamps.	Open Lamps.	Flame Lamps.	Open Lamps.	Flame Lamps.	Open Lamps.	Flame Lamps.		Open Lamps. £ s. d.	Flame Lamps. £ s. d.		
BRUSSELS	238	...	238	238	...	...	440	...	...	...	236	2	...	...	98 to 115	...	19·7	...	82 to 98	...	Not stated				2200 (half night only)	14 9 7	...	M.	
COLOGNE	426	426	...	325	...	101	770 and 1100	...	550 and 690	72	131	205	...	...	88 to 115	121 to 148	26 to 33		23 to 148		0·08	0·13	0·13	0·43	3905 and 1817	11 5 6	9 6 3	M.	
DÜSSELDORF	334	24	310	310	..	24	660	...	650	...	139	185	..	10	164	197 to 394	29 to 33		33 to 98		Not determined				3800 and 1900	...	...	M.	
BERLIN	864	...	864	...	...	...	...	...	...	8	656	200	...	...	98 to 131	98	26 to 31	26, 39 and 52	72; 52 to 98; 197		0·16	0·5	0·5 to 0·6	1·5	3675 and 1900	...	...	C.	
DRESDEN	425	425	...	124	...	301	500 and 375	..	350	...	238	180	7	...	148	180	26	26	65	65	Not measured			...	3700 and 1620	£ 25	s. d. 19 8	M.	
VIENNA	1155	16	1139	1153	2	...	660, 530, 400 (d) 800 (a)	660	...	11	15	5	...	4	115	...	39 (16 amp. lamps) 33 (12 „ „) 26 (9 „ „)		98	...	0·25	..	0·425	...	3871 1978	35 8 4; 28 15 0; 19 11 8; 16 5 0	(15 ampère); (12 „); (15 „); (12 „)	M.	35 Lamps all night. 1118 Lamps half night.
MUNICH	900	...	900	822	...	78	450 and 270	...	300	18	435	485	...	18	197	164	33	33	82	69	0·025	0·08	0·12	0·22	3805 and 1842	29 8 3	26 19 3	M.	
PARIS	1899	559	1340	...	...	...	450 (d) and 500 (a)	...	260	18	99	...	...	...	98	98	13 to 20		65 to 98		Not determined				4280 and 2140	...	...	C.	
CITY OF LONDON ... ... (Main Street—Ordinary Lighting)	400	...	400	380	...	20	500	...	370	43	319	2	...	36	126	...	18·5	...	50	...	...	...	...	...	...	26 0 0	17 10 0	C.	The open type Lamps give approximately half the illumination given by flame arcs.
Ditto ... ... (Cannon Street—Experimental)	11	...	11	...	...	11	...	...	385	...	...	...	11	...	...	138	...	28	...	50	...	0·1	...	0·7	4280	...	17 10 0	C.	
Ditto ... ... (Holborn—Experimental)	21	...	21	...	...	21	...	...	370	6	15	...	...	...	...	135	...	20·5	...	77	...	0·06	...	0·35	4280	...	17 10 0	C.	
Ditto ... ... (Farringdon Street–Experimental)	18	...	...	...	18	...	...	...	...	4	14	...	...	...	...	...	...	...	...	...	...	...	...	...	4280	...	12 10 0*	C.	*Enclosed Lamps

Comparative Light Standards { In Paris and Brussels, the "Carcel" is the Illuminating Standard. One Carcel = 9·50 British Candles. One British Pentane Candle = 0·104 Carcel Unit.
In the German Cities visited, the "Hefner Kerze" is the Illuminating Standard. Eleven "HK's" = 10·00 ,, ,, One British Pentane Candle = 1·1 Hefner Units.

N.B.—The German "Hefner Kerze" and the French "Carcel" have been brought to "British Candles," and the Austrian, German, Belgian, and French currencies and measurements to English equivalents, for the purpose of comparison.

Dresden.

Dresden, the capital of the Kingdom of Saxony, contains a opulation of about 476,000 people. The city lies on both banks the Elbe, and has an area of 26 square miles. The deputation spected the lighting under the guidance of two inspectors, who ere placed at the disposal of the deputation by the Director of as, Water, and Electricity Works. The total number of electic arc lamps in Dresden is 425, supplied by alternating current, e type of lamps used being: Open, 124; flame, 301—the open mps taking 500 and 375 watts, and the flame lamps taking 350 atts. There are 238 lamps fixed upon side-posts; 187 being spended across the centre of the streets, with side lowering ear. The average distance between open lamps is about 148 et, and flame lamps 180 feet. The lamps are fixed at a height about 26 feet in streets having an average width of 65 feet. The average cost per lamp per annum, including interest on capital outlay, depreciation, and all other charges, is about £26.

Electric glow lamps are largely used in the streets, and are fixed upon standards and brackets, and also centrally hung. Seventy-two carbon filament lamps are of 14 and 22 candle power, and take 55 and 87 watts respectively; 437 metal filament lamps are of 22, 44, and 260 candle power, and take 30, 60, and 330 watts respectively. The lamps are fixed about 100 feet apart at a height of 16 feet, and cost £2 14s. per lamp per annum.

The side streets are lit by means of low-pressure incandescent gas in lanterns fixed upon brackets. The electric arc lamps are switched off at midnight, leaving incandescent gas lighting only. There are 11,715 low-pressure incandescent gas-lamps. The type of lamp used gives an illumination of 82 to 109 candles, and consumes about 5 cubic feet of gas per hour. The lamps are fixed

Electric Glow-Lamp Lighting.

Name of City.	Total number of Lamps.		C P. of Lamps.		Watts taken by Lamps.		Supports.					Distance between Lamps. (feet)		Average height. (feet)		Average width of Streets. (feet)		Hours of Lighting per annum.		Cost per annum per Lamp.		Municipal or Company.	Remarks.
	C	M	C	M	C	M	Central Posts.	Side Posts.	Central suspension, with lowering gear.	Central suspension, without lowering gear.	Brackets.	C	M	C	M	C	M	C	M	C £ s. d.	M £ s. d.		
BRUSSELS	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.	None used.
COLOGNE	30	87	14	28	50	32	6	14	...	...	...	...	100	...	11·5	...	13	...	...	2 14 0	2 4 0	M.	
DÜSSELDORF ...	120	111	14 and 22	22 and 90	50 and 75	25 and 100	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	The incandescent lamps are used for ornamental lighting, and are mostly placed in lanterns with cut glass on lamp brackets which, both in their form and in height, are adapted to their surroundings.
BERLIN	14	*198	14	440	57·6	140	...	...	...	...	...	...	...	...	...	...	...	3,675 and 1,900	3,675 and 1,900	...	...	...	*177 of these are Nernst lamps.
DRESDEN	72	137	14 and 22	22, 44, and 260	55 and 87	30, 60, and 330	...	77	..	35	397	100	100	16·4	10, 16·4, and 26	49	49	...	...	2 14 0	2 14 0	M.	
VIENNA	686	48	22	44	81	88	686		...	...	...	On	Arc	Lamp	Posts.					6 12 6 3 11 9	All night Half night		
MUNICH	...	96	...	28	...	55	...	..	...	...	...	...	162	...	13	...	33	...	3,805 and 1,842	...	3 8 8 for all-night lamps.	M.	
PARIS	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	None used.
CITY OF LONDON	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	None used.

Comparative Light Standards:
In Paris and Brussels the "Carcel" is the Illuminating Standard. One Carcel = 9·50 British Candles.
One British Pentane Candle = 0·104 Carcel Unit.
In the German Cities visited, the "Hefner Kerze" is the Illuminating Standard. Eleven "HK's" = 10·00 " "
One British Pentane Candle = 1·1 Hefner Units.

N.B.—The German "Hefner Kerze" and the French "Carcel" have been brought to "British Candles," and the Austrian, German, Belgian, and French currencies and measurements to English equivalents, for the purpose of comparison.

Note.—C denotes Carbon filament lamp. M denotes Metallic filament lamp.

about 10 ft. 6 in. above the roadway at distances of 50 to 100 feet apart; the cost per lamp per annum being given as £3.

There are only fifteen inverted burner lamps. High-pressure incandescent gas-lamps are not now installed in Dresden.

Gas and electricity are made and supplied by the Municipal Authority.

Vienna.

Vienna, the capital of the Austria-Hungarian Monarchy, has a population of about 1,600,000. The area of the city is 105½ square miles. The deputation inspected the lighting of the streets under the guidance of the Chief Inspector of Gas.

The general arrangement for lighting is by means of electric lamps upon columns, with incandescent gas-lamps fixed upon brackets below; the electricity being switched off at midnight. The total number of electric arc lamps in Vienna is 1155, of which 1139 are supplied by direct current; 16 only being by alternating current. There are no flame arc lamps used in Vienna for street lighting.

There are only five centrally hung electric lamps in the city. Up to the present, there have been three cases in which arc lamps have fallen, owing to breakage of the wire, but without causing injury to passers-by. The open lamps take about 660 watts, and are fixed upon standards at a distance of about 115 feet, at a height of 25 to 40 feet. The average width of streets in Vienna is nearly 100 feet. The cost per lamp per annum, including interest on capital outlay, depreciation, and all other charges, varies from £16 to £35, according to the hours of lighting.

There are 686 electric glow lamps in use for street lighting, and 148 for three bridges over the Danube: (1) The Reichsbrucke Bridge, with 100 carbon filament lamps of 25-candle power. (2) The Marienbrucke Bridge, with 28 metal filament lamps (tantalum) at 50-candle power. (3) The Brigittabrucke Bridge, with 20 metal filament lamps (tantalum) of 50-candle power. The electric glow lamps are fixed at a height of about 10 feet. At points where the traffic is heavy, as at street crossings, &c., two lateral arms (each with one carbon filament lamp of 25-candle power) are fixed to the arc lamp columns. These glow lamps are not switched on until 12 o'clock at night, when the arc lamps are extinguished. The annual cost of those burning all night is £6 12s. 6d. per lamp, including interest and renewal of lamps; £3 11s. 9d. per lamp being the estimated cost of running the half-night carbon filament lamps.

Only nine high-pressure inverted gas-lamps have been fixed for experimental purposes. These are of the Graetzin type; and the gas is supplied direct from a small compressing station placed in a cellar of an adjacent house, at 53 inches pressure (water-gauge). The consumption of gas with two-burner lamps is 42 cubic feet per hour; the three-burner lamps consuming 84 cubic feet per hour each. At present the lamps are only kept alight until 10 o'clock in the evening. They are fixed upon standards at distances of about 90 to 105 feet apart, at an average height of 23 feet. No statistics can at present be obtained as to the annual cost of these lights. The cost of gas in Vienna is about 4s. per 1000 cubic feet.

Low-pressure incandescent gas lighting is largely used, both with the upright and inverted mantles. The shadowless so-called Ritter lanterns are generally used, consuming about 4 to 4¼ cubic feet of gas per hour, and giving a light of about 63 candles. The lamps are fixed about 11 ft. 6 in. above the roadway, measured from the burner, and are placed 60 to 66 feet apart, and are fixed upon standards upon the side of the footways. The estimated cost per annum, including interest on capital expenditure, depreciation, and all other charges, is for a single burner, evening £2 3s. 7d.; all night, £2 12s. 3d.

The type of lamp principally used for the inverted incandescent gaslight is the Graetzin burner, made by Enrich and Graetz, of Berlin, and contains two burners, with chimney for draught and ignition-hole. The lamps consume about 7½ cubic feet per hour, and give an illumination of 234 candles. They are fixed at a height of about 14½ feet from the roadway, at distances of about 50 feet; the lamps being fixed on standards on the footways.

The side streets are lighted generally with incandescent gas-lamps (low pressure), fixed on wall-brackets, and placed at an average height of about 11½ feet, and about 82 feet apart on the diagonal.

Gas and electricity are made and supplied by the Municipal Authorities. There also exist two privately owned Gas Companies, and one private Electric Light Company.

Munich.

Munich, the capital of Bavaria, has about 540,000 inhabitants. It is one of the largest cities in the German Empire, having an area of about 34 square miles. On arriving, the deputation were received by the Director of Gas Lighting and others, including the British Vice-Consul, William E. Soltau, Esq.

The number of electric arc lamps in Munich is about 900, supplied by direct current. Open lamps of the Alba-Carbon type are generally used, taking 450 and 270 watts. There are also 78 flame lamps taking 300 watts. About one-half of the lamps are fixed upon standards at distances of about 200 feet apart; the lamps being about 33 feet above the pavement level in streets about 80 feet wide. The flame lamps are placed at average distances of 160 feet, at a height of 33 feet, in streets about 70 feet wide. Centrally hung lamps are fitted with lowering gear; and in some of the widest streets as many as three arc lamps are suspended across the road on a single line. The cost per lamp per annum for electric arc lamps, including interest on capital outlay, depreciation, and all other charges, was stated to be for open lamps, about £29; and flame lamps, £27—the current being supplied by the Municipal Authority.

Of electric glow lamps, there are 96 in use; metal filament lamps being generelly adopted, of 28-candle power, taking 55 watts. They are fixed upon central posts (three in each lantern), and also on brackets; the distances between the lamps being about 162 feet, at a height of 13 feet in streets about 33 feet wide. The cost per annum per lamp, including capital expenditure, depreciation, and all charges, for metal filament lamps, is £3 8s. 8d.

High-pressure incandescent gas-lamps are not at present installed in Munich.

In the low-pressure gas-lamps, Welsbach upright incandescent burners are used, consuming about 3½ cubic feet per hour. The illuminating power was stated to be 72-candle power; the lamps being fixed about 11½ feet above the roadway, at distances of

NAME OF CITY.	Miles of Main Streets in lighting.	No. of Lamps.	Type of Lamp.	On Compressor or Main.	Inches Pressure (Water gauge).	Width of Street. (Feet)	Consumption of Gas in cubic feet per Hour.	Candles per cubic foot of Gas.	Lighting Hours per Annum.	Lamps alight all night.	Distance apart on the Diagonal. (Feet)	Lamps on Central Standards.	Lamps on Side Standards.	Brackets.	Height of Lamp Roadway to Burner. (Feet)	Price of Gas per 1000 cubic feet for Public Lighting. £ s. d.	Total cost of Lamp per annum (inclusive) £ s. d.	Municipal or Company.	REMARKS.
BRUSSELS	...	...	...	...	...	...	...	...	...	..	..	...	...	...	...	0 1 7	...	M.	No high-pressure Lamps.
COLOGNE	...	10	459 to 1,080 c.p. (about).	Compressing Plant ...	(Only 10 Trial, Inverted, High-pressure Lamps of various types.)								...	...	...	...	No experience yet.	M.	No results yet obtained (experimental).
DÜSSELDORF ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.	No high-pressure Lamps.
BERLIN ... ... (Alexanderstrasse.)	24·8	1,531 (of all kinds).	Upright Burner, 636·36 c.p. (about)	Compressing Plant ...	53·15 to 78·75	68·9	21·2	30·01	3,675 and 1,900·50 (evening).	Whole and Half-night.	88·5 to 98·5	No	Yes	No	18·7	0 1 4½	12 3 9	M.	
Do. ... ... (Alexanderstrasse.)	...	...	Upright Burner, 1,364 c.p. (about).	Compressing Plant ...	53·15 to 78·75	68·9	42·4	32·1	3,675 and 1,900·50 (evening).	Whole and Half-night.	88·5 to 98·5	No	Yes	No	18·7	0 1 4½	23 3 1	M.	
Do. ... ... (Markthalle Linden-strasse.)	...	...	Upright, 1 Burner, 545 c.p. (about).	Special Compressing Plant by the "Millennium Co."	53·15	...	17·6	30·86	Not stated.	...	...	No	Yes	No	14·7	0 1 4½	4 8 1*	M.	*Including 10 days' continuous burning during extreme frost to warm Market Hall. Mantles last 17 days.
Do. ... ... (Markthalle Linden-strasse.)	...	...	"Powerfull" Upright, Single Burners, 1,090 c.p. (about). "Elster Co."	Special Compressing Plant by the "Millennium Co."	53·15	...	28·26	38·57	Not stated.	...	...	No	Yes	No	14·7	0 1 4½	6 15 10*	M.	Mantles last 30 days. Gas sold at net manufacturing cost for public lighting, *i.e.*, 1s. 4½d., against 3s. 6d. per 1,000 cubic feet to ordinary consumers.
Do. ... ... (Dönhoffplatz.)	...	...	Inverted (2-Burner), 1,540 c.p. (about).	Compressing Plant ...	53·15 to 67·0	...	42·4	36·2	3,675	...	91·8 to 98·4	No	Yes	No	17·7	0 1 °4½	13 17 10	M.	
Do. ... ... (Potsdamerstrasse.)	...	...	Inverted (3 Burner), 3,367 c.p. (about).	Compressing Plant ...	53·15 to 67·0	118	84·8	39·6 to 40·7	3,675 to 1,900·50 (evening).	Whole and Half-night.	91·8 to 98·4	No	Yes	No	18·7	0 1 4½	21 18 9	M.	Two burners extinguished at midnight.
Do. ... ... (Potsdamerstrasse.)	...	...	Inverted (newest type), 3 Burners, 4,364 to 4,555 c.p. (about). "Graetzin" Lamp.	Compressing Plant ...	53·15 to 67·0	118	84·8	51·45 to 53·6	3,675 to 1,900·50 (evening).	Whole and Half-night.	91·8 to 98·4	No	Yes	No	18·7	0 1 4½	21 18 9	M.	Costs no more than 3,367 c.p. lamp. Two burners extinguished at midnight. Mantles cost 2½d. each. They last about 9 days, and are burnt off in the lamp.
DRESDEN	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.	No high-pressure Lamps.
VIENNA	·1488	9	Inverted (2 and 3 Burner) "Graetzin."	Compressing Plant ...	53·15	...	2 Burners 42·4, 3 Burners 84·8.	Not yet taken. (working to Berlin data)	1,310	All ext'hd at One a.m.	91·8 to 105	No	Yes	No	23·0	0 3 11½	No experience yet.	M.	Light measurements not yet made; experimental only. Been running four months.
MUNICH	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	M.	No high-pressure Lamps.
PARIS	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	C.	Ditto
CITY OF LONDON (Monument Street area.)	Total 1½	42	"Keith" Upright, 1 Burner, 300 c.p. (about).	Water Compressor ...	10	50 to 60	10	30	4,300	Yes	60 to about 70	No	No	Yes	12	0 2 5*	7 5 0	C.	*The price of Gas for all public Lamps was reduced from Midsummer (see page 25). Price for private lighting 2s. 9d. per 1,000 cubic feet. Columns and Lanterns provided by Corporation
Do. ... (Queen Victoria Street.)	...	45	"Keith" Upright, 2 Burners, 600 c.p. (about).	On Trunk Main ...	10	70	20	30	4,300	Yes	100 (about)	No (except refuges)	Yes	No	13·6	0 2 5*	13 2 3	C.	Columns and Lanterns provided by Corporation.
Do. ... (Fleet Street.)	...	17	"Keith" Inverted, 1 Burner, 1,500 c.p. (about).	Gas Engine Compressing Plant.	54	45 to 70	25	60	4,300	Yes	103 (about)	No (except refuges)	No	Yes	13 to 16	0 2 5*	16 10 0	C.	Inclusive cost.
Do. ... (Various.)	(Also several other "Keith" and "Sugg" High-pressure, Upright, 2, 3, 4 and 6 Burner Lamps upon Standards on rests at junction of roadways of 1,000, 1,300, 2,000 and 3,000 candles, fixed at a height of from 13 ft. 6 ins. to 19 ft. 6 ins., measured from roadway to burner, making 119 lamps in all.) In addition to which the four City Bridges are lighted with "Sugg's" High-pressure, Upright Burner Lamps, some 135 in number, giving 30 candles per cubic foot of Gas consumed; they are principally Single Burner Lamps, with clusters on the centres of the Bridges, and have been in lighting about eight years.																		

Comparative Light Standards { In Paris and Brussels the "Carcel" is the Illuminating Standard. In the German Cities visited, the "Hefner Kerze" is the Illuminating Standard. One Carcel = 9·50 British Candles. Eleven "HK's" = 10·00 ,, ,, One British Pentane Candle = 0·104 Carcel Unit. One British Pentane Candle = 1·1 Hefner Units.

N.B.—The German "Hefner Kerze" and the French "Carcel" have been brought to "British Candles," and the Austrian, German, Belgian, and French currencies and measurements to English equivalents, for the purpose of comparison. NOTE.—1 Litre = ·03532 cubic feet. 28·316 cubic metres = 1000 cubic feet.

about 60 feet. The cost of these low-pressure incandescent gas-lamps, including interest on capital expenditure, depreciation, and all other charges, is £4 4s. 4d. per annum. The lamps are fixed upon side-columns. The inverted incandescent gas-lamp is being introduced—about 10 per cent. of the gas-lamps being of this character.

Gas and electricity are made and supplied by the Municipal Authorities.

Paris.

The City of Paris covers an area of about 31¼ square miles; the population being estimated at 2,700,000. The general arrangement for lighting the streets is much the same as in London; electric lamps upon columns being generally used.

The total number of electric arc lamps in Paris is 1899, of which 559 are supplied by alternating current, and 1340 by direct current. The lamps are fixed about 100 feet apart, at about 14 feet to 18 feet high; the main streets of Paris being 70 feet to 100 feet wide. A large number of these lamps are extinguished at 1 o'clock a.m.

Electric glow lamps are not used in the streets of Paris.

The types of incandescent gas-lamps (low pressure) principally used are: Bandsept, Denayrouze, La Couronne, Kern, Honderele and Tricquet, &c.; the 3 feet per hour lamp giving a light of about 66½ candles. The lamps are fixed about 80 feet apart on columns on the sides of the streets. In the Rue de la Paix, which is about 73½ feet wide, standards with three lanterns fitted with

Low-Pressure Gas Lighting.

NAME OF CITY.	Miles of side Streets in Lighting.	Number of Lamps.	Type of Lamp.	Consumption in cubic feet per Hour.	Candles per cubic foot of Gas.	Lighting Hours per Annum.	Distance apart on the Diagonal	Lamps on Central Standards.	Lamps on Side Standards.	Lamps on Brackets.	Average height of Light (Roadway to Burner).	Price of Gas per 1000 cubic feet for public lighting.	Cost of Lamp per Annum (inclusive).	Municipal or Company.	REMARKS.
BRUSSELS... ...	114½	6,911	Upright and Inverted Burners, 55 and 133 c.p.	3·532 and 8·476	15·7	3,843	(Feet). 82·0 to 114·8	No	Yes	Yes	11·5 to 14·7	£ s. d. 0 1 7	£ s. d. 1 4 8½ and 2 17 7	M.	Price for private lighting 3s. per 1,000 cubic feet. Price for private heating and power 2s. 3½d. per 1,000 cubic feet.
COLOGNE	192½	14,000	Welsbach Upright, 63 to 72 c.p. (about)	4·415	14·4 to 16·46	Evening 1,817½, all night 3,905½	65·6 to 98·5	Partly	No	Partly	11·5	0 1 4½	Evening 2 11 8, all night 3 5 3	M.	One electrically lighted road has Gas Lamps also alight during summer, when the trees are in full leaf.
DÜSSELDORF ...	Not known	6,000	Upright 1 Burner, 72 c.p. (about)	4·485	16·65	Evening 1,864½, all night 3,908	Centre of City 82 to 98, Suburbs 98 to 121, outer Suburbs 131 to 164.	Only for ornamental purposes.	Yes	No	10·2	*	Evening 1 14 1 All night 3 8 3	M.	* "The price of Gas is 4s. 5d. per 1,000 "cubic feet; but for the public lighting of "the streets the Gas is not charged." Experiments with Inverted Incandescent Lamps are now being carried out.
BERLIN	466	2,900	Upright Burner, 63 to 70 c.p. (Single burner.)	4·24	14·7 to 16·8	3,675	82 to 92	No	Yes	No	11·5 to 14·7	0 1 4½a	2 3 10 All night	M.	a Net manufacturing cost of gas for public lighting 1s 4½d., against 3s. 6d. to ordinary consumers.
Do.	...	2,600	Inverted (Burners), 91 c.p. (about) (Single burner).	3·533 to 3·886	23·5 to 25·7	3,675	82 to 92	No	Yes	No	11·5 to 14·7	0 1 4½a	2 3 10 All night	M	a Two-burner Lamp, with one burner extinguished at midnight, costs £2 18s. 6d. per annum.
DRESDEN	Not known	11,715	Upright Burner, 82 to 109 c.p. (about)	4·946 (per Burner).	16·5	Evening 1,605, all night 3,730.	49·2 to 98·4	No	Yes	Yes	10·6	0 2 0	2 19 5	M.	Principally Single Burner Lamps. 116 Lamps have from 2 to 7 Burners in each. Only 15 Inverted Burner Lamps.
VIENNA ... (1)	712	34,110	Upright Burner "Shadowless Ritter," 1 Burner 63 c.p. (about)	3·886 to 4·24	15	1,310 (to 1 a.m.).	59 to 65·6	No (only for refuges).	Yes	No	11·5	0 3 11½	Evenings only 2 3 7, All night 2 12 3	M.	"The Municipal Gas Works receives no payment for seeing to public lighting."
Do.	...	...	Inverted 2 Burners "Graetzin" Lamp, 234 c.p. (about)	7·42 to 7·59	31·8 (about).	1,310 (to 1 a.m.).	59	No (only for refuges).	Yes	No	14·7	0 3 11½	Evenings only 3 14 9 All night 5 15 2	M.	Ditto.
Do.	...	...	Upright 1 Burner	(The smallest No. (1), but	Streets are pri spaced further	ncipally as apart).	82	.	...	...	11·5	0 3 11½	Evenings only 2 3 7, All night 2 12 3	M.	Ditto.
MUNICH	Not calculated on the length of streets, but on the area, i.e., 5½ million square yards.	8,807	Upright Welsbach, 72 c.p. (about) (only 10 per cent. Inverted).	3·533	20·58	Evening lamps 1,871, all night 3,736	59 to 65	No	Yes	No	11·2	0 3 5½	(Single Burner) 4 4 4	M.	Cost of gas for private lighting 9s. 9d. per 1,000 cubic feet.
Do.		368 (The smal	Do. Larger type. lest Streets are lighted	principally as	above, but spac	ed further apart).	65 to 82	No	Yes	About 10 % on Brackets.	11·5	0 3 5½	4 4 4	M.	
PARIS	...	...	Various. Not stated if Inverted. 66·50 c.p. and upwards (about)	(Single Burner only taken). 2·825 (and upwards).	(Laboratory measurements) 23·53	...	65·6 to 98·4	No	Yes	Yes	...	...	3 15 7*	C.	*For Single Burners consuming 2·825 c. feet per hour, burning all night.
CITY OF LONDON	44 (about)	2,640	Upright Incandescent "Kern" (Single Burner), about 65 c.p.	4·25	about 15	4,300	60 to 70	No (except for Refuges).	Yes (470).	Yes (2,170).	12·0	0 2 5*	3 10 2	C.	*Price for public lighting was reduced at Midsummer (see page 25). Price for private lighting 2s. 9d. per 1,000 cubic feet. Columns and Lanterns provided by Corporation. There are no public low-pressure Inverted Burner Lamps in the City.

Comparative Light Standards { In Paris and Brussels the "Carcel" is the Illuminating Standard. One Carcel = 9·50 British Candles. One British Pentane Candle = 0·104 Carcel Unit.
In the German Cities visited, the "Hefner Kerze" is the Illuminating Standard. Eleven "HK's" = 10·00 ,, ,, One British Pentane Candle = 1·1 Hefner Units.

N.B.—The German "Hefner Kerze" and the French "Carcel" have been brought to "British Candles," and the Austrian, German, Belgian, and French currencies and measurements to English equivalents, for the purpose of comparison.

NOTE.—1 Litre = ·03532 cubic feet. 28·316 cubic metres = 1000 cubic feet.

incandescent gas-burners (two of these lanterns being extinguished at midnight) are used. The columns are directly opposite one another; the distance between them being about 39 feet. The central one is about 11 ft. 11 in. above the ground; the two side ones, 11 ft. 7 in. The burners consume 8 cubic feet per hour.

There is not any high-pressure gas lighting in Paris.

Electricity and gas are supplied by Companies under arrangements with the Municipal Authorities.

APPENDIX.

City of London.

The total number of electric arc lamps in the City of London is 450. Of these, 380 open arc lamps and 20 flame lamps are fixed upon columns and brackets. The average distance between the open lamps is 126 feet; the average height of the lamps being about 18½ feet. The cost of each of the open lamps is £26 per annum, and of each flame lamp £17 10s.

In accordance with the resolution of the Court of Common Council of July 25, 1907, permitting the two Electric Lighting Companies having statutory powers in the City to experiment with the newest form of electric lamps for street lighting in the thoroughfares of Holborn, Holborn Viaduct, Old Bailey (part of), the lamps being placed about 20 feet from the ground, Cannon Street (between St. Paul's Churchyard and Dowgate Hill), at a height of 28 feet, and Farringdon Street, at a height of 14 feet, the Charing Cross and Strand Electricity Supply Company proceeded with the lighting of their portion—viz., Cannon Street—by erecting 11 Oliver magazine flame arc lamps, centrally hung, and suspended over the roadway by wires attached to the buildings

on either side. The lamps were put into lighting in November, 1907, and £17 10s. per lamp is the price paid for the experimental running. This is the price quoted by the Company for a contract for not less than 250 of such lamps.

The City of London Electric Lighting Company also proceeded with the carrying out of their experiment by substituting 21 Oliver flame arcs for a similar number of the original open arcs, adapting the existing standards in Holborn, Holborn Viaduct, and part of Old Bailey, while in Farringdon Street 18 enclosed arcs of the Reason type were fitted up on special short columns in lieu of the 12 original open arc lamps and columns in that thoroughfare. The installation of this area was completed in November, 1907. The cost of the Oliver flame arcs in the Holborn area is £17 10s. each per annum, being equivalent to the charge for similar lamps in Cannon Street. The cost of the enclosed arcs in Farringdon Street is £12 10s. each per annum. The Oliver flame arc lamps at Ludgate Circus and Ludgate Hill, put into lighting this year, are fixed at a height of 18·5 feet above the roadway, as against 20·5 with the experimental lamps of the same type at Holborn.

High-Pressure Incandescent Gas Lighting.

There are 119 high-pressure Keith gas-lamps in the City thoroughfares; 42 upright single-burner lamps being fixed in the neighbourhood of Billingsgate, on brackets. These lamps consume 10 cubic feet of gas per hour, and give an illuminating value of 300 candles each, at a cost of £7 5s. per lamp. They are from 60 to 70 feet apart on the diagonal, the height of the burner from roadway being about 12 feet. They are fixed upon the house-fronts; the roadway being about 50 to 60 feet wide. The lamps burn at 10 inches pressure from a special water-compressing plant in the adjacent pipe-subway. The Corporation provided the compressing plant, services, lamp-brackets, and lanterns.

Forty-five upright two-burner lamps are fixed in Queen Victoria Street, each consuming about 20 cubic feet of gas per hour, and giving a light equal to 600 candles; the annual cost per lamp being about £13 2s. 3d. per annum. The lamps are fixed upon columns on the footpaths, about 100 feet apart on the diagonal. The burners are 13 ft. 6 in. above the roadway; the street being about 70 feet wide. The lamps burn at 10 inches pressure from a high-pressure trunk main direct from the gas-works; the Corporation providing the standards and lamps.

Seventeen high-pressure single-burner lamps (inverted mantles) have been fixed in Fleet Street and Chancery Lane, upon brackets on the house-fronts. These lamps each consume 25 cubic feet of gas per hour, and give a light of 1500 candles, at an inclusive charge of £16 10s. per annum. They are supplied from a special 6-inch high-pressure main connected with a compressor-house in the immediate neighbourhood; the pressure being 54 inches (water-gauge). These lamps are about 103 feet apart on the diagonal; the height of the burners from the roadway being 13 to 16 feet. The street is from 45 to 70 feet wide. The Gas Company provide the necessary compressing plant, mains, services, brackets, and lanterns.

There are also several other Keith and Sugg high-pressure lamps, fitted with upright two, three, four, and six burners, on rests at the junction of roadways, of 1000, 1300, 2000, and 3000 candles—making 119 in all. In addition to the above, the four City bridges are lighted with Sugg's high-pressure upright-burner lamps, some 135 in number, giving 30 candles to the foot of gas. They are single burner lamps with clusters on the centre of the bridges, and have been in lighting for about eight years, having been installed and maintained by the South Metropolitan Gas Company. The gas is compressed by separate gas and water driven machinery on the bridges, except at Blackfriars, where the gas is taken direct from the high-pressure main of the Gaslight and Coke Company. The aggregate length of the four bridges is about one mile; the widths of the roadways varying from 45 to 70 feet.

An experimental three-burner inverted Keith high-pressure lamp has been fixed in Fleet Street, consuming the same amount of gas as the single burner, and gives, it is stated, a like illumination—viz., 1500 candles—but with a better diffusion. Its improvement is that, if one mantle breaks, the remaining two will give a good light until a new mantle is put on, instead of the lamp being out. The annual cost of the lamp would be the same as for the single burner.

In Queen Victoria Street, on the rest by Queen Street, an experimental four-burner Keith high-pressure inverted lamp has been fixed in one of the existing high-pressure lanterns, in place of the two upright burners. The consumption of the four burners is the same as the upright burners—viz., 20 cubic feet per hour. It is claimed that the candle power is increased about 50 per cent. —viz., 45 instead of 30 candles per cubic foot of gas—giving a total of 900, instead of 600 candles. The maintenance cost would be the same.

The Keith Lamp.

For the purpose of comparison, the Keith inverted lamp gives 60 candles per foot of gas consumed, against 51 to 53½ candles, and 25 feet consumption against 28 feet of the Graetzin. Therefore:

Keith single burner, 25 feet per hour, at 60 candles per foot, as tested on photometer, equals 1500 candles.

Graetzin single burner, 28 feet per hour, at 51 to 53½ candles per foot, as claimed by Berlin figures, equals 1400 to 1500 candles.

A specimen of the newest form of Graetzin Lamp with three burners has also been fixed in Fleet Street on the existing compressing plant, giving an illuminating value of about 4400 to 4555 candles, with a consumption of about 84 cubic feet of gas per hour.

Incandescent Gas Lighting—Low Pressure.

The number of gas-lamps, principally single burners of the upright type, at the end of the year 1908, was 2640—each consuming 4¼ cubic feet of gas per hour—the illuminating power being 65 to 70 candles. Owing to the narrowness of the side-streets, the lamps are nearly all fixed on brackets about 60 to 70 feet apart, at a height of about 12 feet from the roadway to the burner; the annual cost of each lamp, with gas at 2s. 5d. per 1000 cubic feet, being £3 10s. 2d. This cost includes maintenance of mantles, &c., but it does not cover capital charges. A few two, three, and five burner lamps are fixed upon standards on the rests in the main roads and squares.

Low-Pressure Inverted.

The only low-pressure inverted gas-lamps in the City are a few Carpenter one and two burner lamps on trial, with a stated consumption of 4 and 8 cubic feet per hour, and 100 and 200 candle power respectively, being a claimed efficiency of 25 candles to the foot of gas consumed.

The price of gas for public lighting up to Midsummer was 2s. 5d. per 1000 cubic feet; but this amount was then reduced by 1d., and a further reduction of 2d. per 1000 cubic feet will be made as from Jan. 1, 1910, when the Gaslight and Coke Company will reduce the illuminating value of their gas from 16 to 14 candles, under their Bill now before Parliament, which has passed the third reading of the House of Commons. The effect of these reductions will be to decrease the annual cost of the newest type of high-pressure inverted gas-lamp, as in Fleet Street, from £16 10s. to £15 2s. 6d., and all other gas-lamps proportionately.

FOR TABULATED PARTICULARS OF INFORMATION OBTAINED FROM VARIOUS CONTINENTAL CITIES, AND OF THE LIGHTING IN THE CITY OF LONDON, SEE PAGES 177-80.

MANTLE-MAKING APPARATUS.

The weekly journal "Das Echo," of the 10th ult., contained an article on apparatus for modern incandescent mantle manufacture, in which the various appliances made by the firm of Max Sensenschmidt, of Frankfort-on-Maine, were described. These appliances were seen recently at the works of the makers by a representative of the "Journal;" and some particulars of the special points in their design may be given.

An apparatus known as the "Triumph," for burning-off ten or a larger number of mantles, is so arranged with interchangeable burners that it may be used for burning-off any size or any description of mantle, whether upturned or inverted. The series of burners, which are connected by flexible tubing with the high-pressure gas supply, is moved by hydraulic pressure at a uniform rate from the top to the bottom of the mantles, so that the burning-off is uniform, and unequal hardening of the mantles—such as is apt to ensue when they are burned-off by hand—is avoided. The hydraulic power is obtained from a connection to the ordinary water-service, and the rate of movement of the burners is regulated by a lever. The apparatus needs so little attention in operation that one girl can attend to two or three machines, and in this way burn-off and harden from 3000 to 4000 mantles a day. Another useful piece of apparatus is an impregnating and wringing or pressing machine, for expelling the superfluous fluid from the impregnated mantles. The mantles are pressed between rollers of ebonite and india-rubber, the pressure of which is regulated by means of a central balance-weight so that it is uniform throughout. The mantles are automatically carried to the rollers by means of a conveying band of india-rubber, and the rollers are kept clean by the use of a glass scraper. The superfluous fluid drips into a tray below. Among other apparatus for mantle manufacture made by the same firm may be mentioned a machine for trimming the bottom of the collodionized mantles so as to cut them off to the proper length. The mantle is revolved on a spindle in contact with which is brought, at the desired height, a cutting wheel, which removes cleanly and accurately the superfluous portion of the fabric. The conical spindle on which the mantle is placed is held by light friction only on the rotating axis; so that if the knife is pressed too hard against the cone, the latter ceases to revolve and is not damaged by the knife. Durability of the knife and cone is thus secured. Special dipping appliances for the collodionizing of mantles are also made by the firm, as well as various forms of shock machines to test the strength of mantles.

Herr A. Bremer has taken out a German patent for a device for removing the thick tar from the hydraulic mains of coking plants. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," it consists of a scraper in combination with a movable framework. When the scraper is drawn in one direction, it is held in position with its face in contact with the framework, and is able to displace the tar; but when drawn in the other direction, it is not supported by the framework, and glides over the surface of the tar.

THE PARSY RETORT FURNACE.

By M. Grebel.

[Abstract Translation of a Paper read before the Société Technique.]

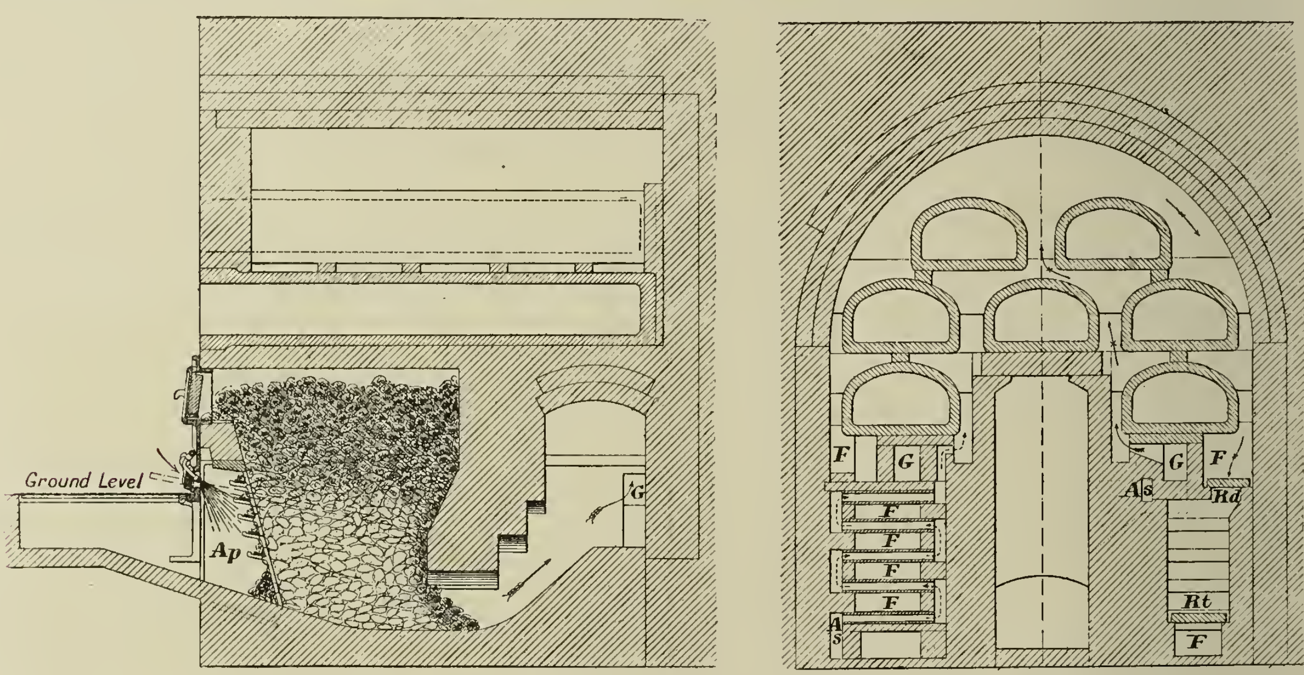
Although invented recently—at the end of 1906—the Parsy furnace has rapidly become a success. There are already 139 settings in France, Algiers, Belgium, Greece, Italy, Roumania, and Russia. Its chief advantages are facility of supervision and of clinkering, owing to there being no cellar; carbonizing power and fuel economy comparable to the most complicated and expensive furnaces, owing to the production of a good mixed gas and sufficient regeneration; easy adaptation to the arches of old fire-bar beds; and entire construction above ground, making it particularly suitable for sites liable to submersion.

Apart from double combustion producers, there are to-day producers of the following types: (1) Those with direct combustion, vertical and upward, like that of Ebelmen, which resembles a small blast-furnace. (2) Those with inclined combustion, from bottom to top and from front to back, like the original Siemens furnace and those derived from it, among which copies of the Lencauchez type, either with or without "weir" walls and with "stepped" fire-bars, are the best known in France. (3) Those with reversed combustion, vertical and downward, like that of M. Deschamps, which are not used otherwise than for poor gas engines. The new and original idea underlying the design of the Parsy producer, applicable to heating furnaces and to feeding poor gas engines, is essentially that of compelling the combustion and the reduction of the gases to take place horizontally. If the upper part of this producer is considered, it may be described not only as one with horizontal combustion, but partly also with reversed and inclined from top to bottom.

Description of the Furnace.

As will be seen from fig. 1, the primary air, Ap only enters the furnace arch, as shown by the simple arrow, through an opening that can be regulated in the cast-iron door. This opening is used also for injecting water and for inserting false or spear bars for clinkering. The gas made in the producer is led to the nostrils, following the barbed arrows, by two distributing passages G, placed separately on the sides, or together on the top of the producer. The secondary air, As, follows the dotted arrows, and rises in and out of the potteries placed one on top of the other and taking up the whole depth of the bed; while the spent gases F successively lick the two faces. Collected in two small passages As, arranged on each side of the producer, the secondary air is distributed by openings inserted between those for the mixed gas. All passages for air and gas, it may be noted, are placed horizontally, with a view to avoiding any obstructions.

So as to insure the proper heating of all the retorts, the flames are obliged, by longitudinal walls, to go up to the centre of the setting, in order to come down again at the sides, as shown by the arrows marked with a cross. There is time for complete combustion during this passage. The waste gases F, drawn by the chimney, the draught of which is regulated by the damper R, thus pass into the regenerators. The damper Rd, worked from the ground level, prevents the cooling of the setting by the inrush of unburnt air during clinkering. As can easily be seen, the gases have to pass through a constant thickness of coke which, being kept red hot by locating the furnace towards the floor of the ash-pit, ensures the regular reduction of the carbonic anhydride into carbonic oxide.



Longitudinal Section. Cross Section.

Fig. 1.—The Parsy Regenerative Furnace, with Horizontal Producer.

Ap. Primary Air—the plain arrows. As. Secondary Air—the dotted arrows. F. Water Gases—the arrows with × on shaft. G. Mixed Gases—the feathered arrows. Rd. Clinkering Damper. Rt. Draught Damper.

Figs. 2 and 3 show, by photographs taken in course of construction, a Parsy furnace being adapted to old arches of direct-fired beds at the Beaucaire and Saint-Germain Gas-Works. A bench of seven beds so transformed is now at work at Amiens. At Romorantin, arches of four retorts, only 1·70 metres (5 ft. 7 in.) wide, have been utilized by grouping the regenerators together on one side of the producer.

Comparison with Other Settings.

One of the advantages of the Parsy furnace is that a real producer can be put in in place of the ordinary direct fire-bar furnace. While complete installation of an ordinary bed of seven retorts only costs about 1000 frs. (£40) per retort, a producer bed with subway costs approximately 1800 frs. (£72) per retort. The adoption of half-subways of reduced sizes lessens a little the first cost, but makes the working difficult and dangerous. Costs of construction are still considerable, owing to water infiltration, &c.; and small gas-works consequently often give up the idea of taking advantage of heating with producers.

In other cases, it is required to utilize the existing arches and fittings and pipes. At the moment of remounting the retorts, the old ordinary beds should be able to be replaced by producers and regenerators in the same arches. If this be effected, at the same time, the problem is solved of finding a furnace for low-lying lands where one cannot go to any great depth. If the idea of the horizontal producer had been thought of at the outset of producer design, without doubt the double-stage or subway arches would not have been erected. When the time came for discarding ordinary fire-bar furnaces, only part-producer or half-producer types were adopted, which did not fulfil the hopes that were raised by them. The Guéguen setting, the Jouanne type, and the De Lachomette system (known as a mixed furnace with reduced regeneration) give a gas very poor in carbonic oxide, which falls off very rapidly with the fall in the height of fuel from a maximum of 1 metre to 0·80 metre (say, 3 ft. 3 in. to 2 ft. 8 in.) to 0·75 metre to 0·50 metre (say, 2 ft. 6 in. to 1 ft. 8 in.). The saving in fuel was illusory; and the furnace and bars were worn out as quickly as in ordinary beds.

In Germany, favour continues to be shown to half-producer beds in small works, as they lend themselves to variations in make, while giving a fairly regular temperature, though they are not so easy to supervise, and are more delicate to manage, than direct-fired furnaces. The Germans have aimed at reducing the regeneration to its simplest expression. Jouanne and Guéguen, on the other hand, while restricting the surface, have sought to establish double regeneration, which offers difficulties of management. They have based their efforts on too theoretical considerations, all the less explicable as they relate only to partial producers.

Advantages of the Horizontal Producer.

To burn 1 kilogramme of carbon directly into the form of carbonic acid, or in two stages by way of carbonic oxide, does not

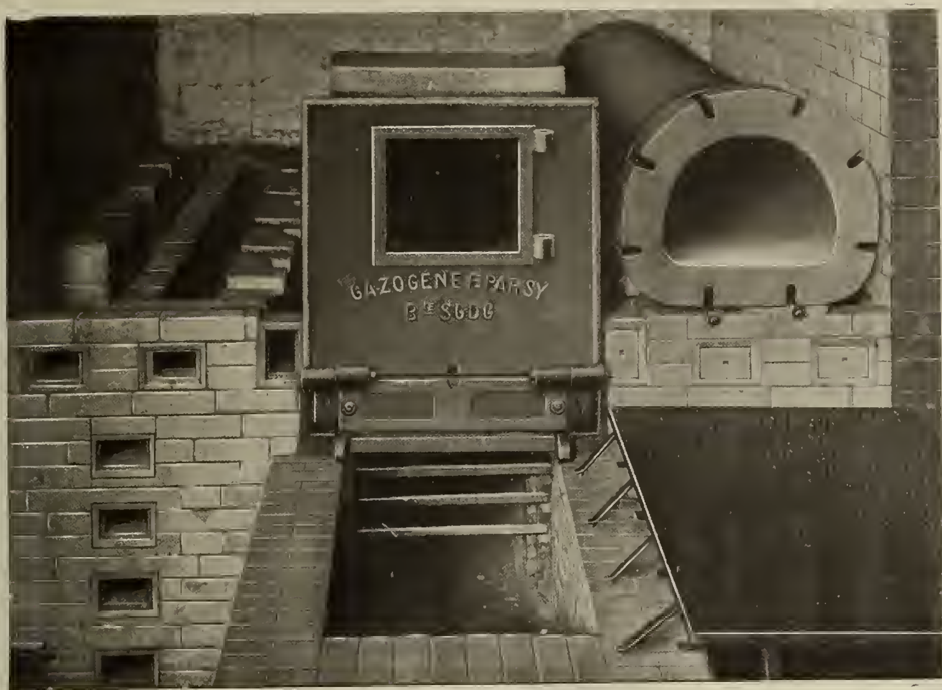


Fig. 2.—One of Three Beds in Course of Transformation at the Beaucaire Gas-Works of the Union des Gaz Company.

elease more than 8080 calories. To decompose the water in the ırnace so as to consume its hydrogen, does not bring about any ıpplementary heat. The combustion of the hydrogen releases n amount of heat exactly equal to that which is necessary to set at liberty. The well-known superiority of heating by producers oes not arise from either the two phases of combustion or from ıe formation of hydrogen. The principal advantage common) producers is obtaining uniform high temperatures. Thus, I. Euchène found in a Siemens furnace 1250° C. near the ostrils and 1050° C. at the inlet to the regenerators; while in n ordinary furnace the temperature near the furnace-arch at the ottom of the middle retort was 1350° C., falling to 975° C. at the utlet to the chimney. The result is that all the retorts of the 'aris Gas Company's type, 3 m. by 0·64 m. by 0·35 m. (say 10 ft. y 25 in. by 14 in.), in a regenerative setting, can be charged ith 900 kilos. (say, 17 cwt. 3 qrs.) per 24 hours; while 800 kilos. 5 cwt. 3 qrs.) is the average with a fire-bar setting. The unit of roduction and the yield are thus increased. In addition, the egular heating doubles or trebles the life of the retorts. The ıving in fuel is due to: (1) The higher temperature causing rapid arbonization of the coal; (2) the reduction in the excess of air, hich in an ordinary furnace is never below $4\frac{1}{2}$ per cent., while ith Siemens gas it can be regulated to 2 per cent.; and (3) above ll to the considerable reduction in the loss through the waste ases thanks to regeneration. By heating the secondary air by ıe waste gases which are cooled from 1050° to 600° C., double conomy is effected. The more the consumption of fuel is re-uced, the more the waste gases are diminished.

The producer-bed should be compact, so as not to offer surfaces or radiation; the refractory mass should be as small as possible; he passages for the hot gases between the point of production or ıeating and their utilization should be exceedingly short. Beds f three stages give bad results. A large company experimented nd found a direct-fired bed consumed 22 per cent. of fuel. It vas altered to a producer-bed with simple regeneration, and did ıot consume more than 15 per cent. When it was turned into a ıed of double or triple regeneration, it was surprising to find the uel went up to 20 per cent. Theoretically, the waste gases may ıe cooled to 150° C., when the chimney is sufficient. It is possible o heat the primary air (supplying the producer), to inject steam, nd even to heat the gas leaving the producer. We do not notice lirect regeneration of the waste gases, based on the reaction $CO_2 + C = 2\,CO$, which consists in passing a portion of the vaste gases with the primary air into the producer, as it is hardly ıracticable. Double regeneration compared with simple regene-ation has always given bad working results, though calculation vould seem to show an economy of 20 per cent. In addition, it ıecessitates increased first cost; it is difficult to control; and the eeping of the fire-bars is compromised, even when the primary ir is heated after, not at the same time as, the secondary air.

M. Euchène, in his masterly report of 1900,* established that or simple regeneration it was enough to bring the secondary air o 1000° C., which corresponds to a cooling of the waste gases o 600° C. It is therefore useless to exaggerate the regenerative urface. The regenerators of the Parsy furnace are amply suffi-ient, although they occupy but small space compared with other egenerative beds. Also, spite of their simplicity, the consump-ion of fuel for a Parsy bed of seven to eight retorts is less than 16 or 15 per cent., and for a bed of three to five retorts, it is less than 18 or 17 per cent. in ordinary working.

Other accessory advantages of producers may be noted—the keeping of the furnace-arch, the time intervals for feeding, and particularly the facility of starting in work. It has already been mentioned that the retorts are not subjected to uneven tempera-tures and to variations due to sharp inflows of cold air when the furnace-doors are opened. In this last item, the Parsy producer has a great advantage, as on opening the furnace feeding-door, the cold air has perforce to pass through a mass of incandescent

Fig. 3.—One of Five Beds in Course of Transformation at the Pecq Gas-Works of the Compagnie du Gaz de Saint-Germain

* See "JOURNAL," Vol. LXXVI., pp. 1080, 1141.

coke. The sides of the combustion-chamber and the fire-bars are not subjected to any intensive combustion, which is so destructive in ordinary furnaces. The temperature of the gas leaving the producer is, in fact, only about 750° C. By the injection of steam, the zone of reaction can be cooled to 1000° C., without compromising the practical total reduction of the carbon dioxide. The large fire-bar surfaces able to be used allow of slow combustion and pliability of working, regulated by the thickness of clinker and ash left on the bars.

It is well known that, in producers with direct combustion, the gas tends to escape the reactions by passing along the sides or by short cuts through the mass of coke. In consequence, large producers have been designed that are like great caverns. Even with draughts of 2 to 2½ mm. (say, 1-10th), which are not practicable, the difficulty is not avoided. They are great consumers of coke, which is not supplied in large enough quantities; so that, going from bad to worse, the producers are allowed to work like direct fire-bar furnaces. It must not be forgotten that every combustion chamber of small consumption should be of small dimensions. In the Parsy producer, the take-off of the gases, being at the bottom of the ash-pit, counteracts their tendency to make short cuts by reason of their ascending force. It compels them to travel slower, and to remain in contact with the red-hot coke. The absolute and constant distance of 1·10 metres (3 ft. 7⅜ in.) between the opening of the "weir" and the fire-bars, where the gas reduction takes place, suffices to ensure the practically entire decomposition of the carbon dioxide. This was at first doubted by engineers of gas companies; but on making the analyses of the producer gas, they found the composition extremely good, containing about 35 per cent. of combustible gas. Only the seal against the "weir" wall at the bottom of the furnace has to be maintained. In a producer with vertical combustion, an arch of fuel should not be allowed to be formed, nor the height of the fuel to fall below 1·20 metres or 1 metre (say, 47 or 39 inches) as a practical minimum.

By reducing the draught and completely closing the air-inlets, the furnace keeps up its temperature, owing to air leaking in, though a fire-bar furnace could not be shut down without risking its being let down altogether. There are several very small works where the producers, so closed up, are entirely left for the night; the precaution often being also taken of covering the fire with coke dust.

The Production of Mixed Gas.

M. Euchène has shown that in a producer there is formed first of all, near the fire-bars, CO_2 by the exothermic reaction $C + 2\,O = CO_2$. One kilogramme of C gives rise to 5·666 kilos. of CO_2 and releases 8080 calories. In presence of the C, the CO_2 tends to be changed into CO, which is itself able to be dissociated by reason of the reversible transformation $CO_2 + C \rightleftharpoons 2CO$. The reduction of the CO_2 by the C is clearly endothermic; 1 kilo. of C reacts on 3·666 kilos. of CO_2 while producing 4·666 kilos. of CO and taking up 3229 calories. According to M. Boudouard, the transformation of the CO_2 into CO is increased by rise of temperature. It is practically complete above 950° C., and impossible below 450° to 300° C. If, at a constant temperature, the pressure of the CO_2 is reduced, in contact with C, the proportion of the CO possible in the series (CO_2, CO, and C) increases. In addition to the influence of temperature and pressure, the speed of reaction increases with the extent of the contact surfaces of the gaseous element and of C; it is retarded by the speed of the current of air; but the effect of this is less marked when the temperature is higher.

The decomposition of the steam by the carbon can operate according to the two extreme reactions—

$$H_2O + C = CO + H_2$$

at high temperature and sufficient speed;

$$2\,H_2O + C = CO_2 + 2\,H_2$$

at low temperature. The former absorbs 28,650 calories, and the latter 18,550. The intermediate reaction—

$$2\,C + 3\,H_2O = CO_2 + CO + 3\,H_2$$

absorbs 47,200 calories.

$$CO_2 + C = 2\,CO,$$

it is known, absorbs 38,750 calories.

In the practical formation of the mixed gas which contains CO_2, CO, H, and N, an equilibrium between the producer components and their products of decomposition is established—

$$CO_2 + H_2 \rightleftharpoons CO + H_2O.$$

M. Boudouard, who has calculated the constants of these mixed gases, after the formula of M. Le Chatelier, has found, for example, that at 730° C. a producer gas containing 5 per cent. of CO_2, 10 per cent. of H_2, and 20 per cent. of CO would hold 0·3 to 0·4 per cent. of steam.

These considerations throw a new light on the incomplete combustion of carbon. The more the contact of the gas with the fuel is prolonged, the more the real composition of the gas is in proportion to the limit, which it is useless to seek to go beyond. The best conditions for the production of the mixed gas are a high temperature of fuel, great porosity and suitable size, and a minimum speed of the gaseous current.

M. Euchène says that "in order to work under the best conditions, it is necessary that the water to be turned into steam should serve only the cooling of the fire-bars and be applied strictly to the absorption of the excess of heat which has not been utilized for the transformation of carbonic acid into carbonic oxide." Theoretically, this is so, but, in the author's opinion, is too absolute. The direct spraying by an injector, working at low pressure, used by M. Parsy, allows of perfectly cooling the fire-bars. As for the steam which passes through the producer without becoming decomposed, it can be entirely avoided. If the secondary air is heated by means of the waste gases, the decomposition of a certain amount of steam by the lost heat allows of regenerating a larger amount of heat, as the volume of secondary air increases proportionally with the volume of steam decomposed. On the other hand, the theoretical temperature of combustion of water gas (2030° C.) is higher than that of air gas (1500° C.); and sufficient importance is not attached to this fact. There have not been, unfortunately, exact experiments on the variations of the consumption with the temperature and the yield desired. In a reversible transformation like $2CO \rightleftharpoons CO_2 + C$, it cannot be avoided that a part of the CO_2 will escape the reduction. This CO_2 corresponds to a liberating of heat which can be taken up usefully only by the decomposition of an appreciable amount of H_2O. Consequently, it is impossible to determine *a priori* the most suitable amount of steam to introduce into a producer.

As academic discussion cannot settle this question, the author examines by detailed calculations (of which the following is a summary) the proportion of heat able to be stored in the furnace for a like outlay of fuel.

(1) *Theoretically without Water (in the Absence of CO_2).*—This is supposing that the combustible gas is produced with nothing but air. The composition of this theoretical air gas would be—

	In Weight.	In Volume.	Per Cent.
CO	28	22·32	34·7
N	52·960	42·16	65·3
	80·960	64·48	100·0

One kilogramme of C would produce, under these conditions, about 5699 of its 8080 calories, and in the form of 5·39 cubic metres of air gas.

(2) *Theoretical Maximum with Water (in the Absence of CO_2).*—The composition of the gas would be—

	In Weight.	In Volume.	Per Cent.
CO	65·030	51·99	40·4
H	2·000	22·32	17·3
N	68·558	54·58	42·3
	135·588	128·89	100·0

The introduction of water would be 647 grammes per kilo. of C. One kilogramme of C would produce, under these conditions, about 7786 of its 8080 calories, and in the form of 4·62 cubic metres of mixed gas much richer than the theoretical air gas.

(3) *Theoretical Maximum with Water (in the Absence of CO).*—The total gas produced would have the following composition:

	In Weight.	In Volume.	Per Cent.
CO_2	62·600	31·66	28·5
H	4·000	44·65	40·2
N	43·718	34·80	31·3
	110·318	111·11	100·0

The introduction of water would be 2·115 kilos. per kilogramme of C. One kilogramme of C would produce, under these conditions, about 6873 of its 8080 calories, and in the form of 6·54 cubic metres of a hydrogen gas which is not poorer than the theoretical air gas.

In the first hypothesis, the percentage of combustible elements is 34·7; in the second, it is 57·7 (or 44·5 taking into account the heat removed by the gas); and in the third, it is 40·2 (or 26·7 taking into account the heat abstracted by the gas). It is curious to note (as shown in the following table of different analyses) that both in the new producers for retort-beds as well as in those for engines, in which the proportion of water is pushed up to 500 to 750 grammes per kilogramme of coke (containing ordinarily 0·8 C), the gas obtained is intermediate between the theoretical gas in hypotheses Nos. 2 and 3, taking into account the heat taken away by the gas.

	CO.	H.	Hydro-carbons.	Combustible Elements.	CO_2.	N.	Incombustible Elements.
Theoretical air gas	34·7	..	..	34·7	..	65·3	65·3
Mixed gas from coke-producers for engines—							
Lencauchez	21·76	10·83	2·48	35·07	3·57	61·36	64·93
Lecomte	24·50	14·50	..	39·00	9·00	52·00	61·00
,,	23·00	15·00	..	38·00	11·00	51·00	62·00
Lencauchez	27·06	12·83	0·98	40·87	3·57	55·56	59·13
Mixed gas from coke-producers for retort-beds—							
Bunte, Munich beds	20·60	15·00	..	35·60	8·60	55·80	64·40
Euchène, Siemens beds	25·00	8·00	..	33·00	6·00	61·00	67·00
Bancelin, Schilling beds	22·50	15·00	..	37·50	8·40	54·10	62·50
Montargis Gas-Works, Parsy beds	24·00	10·50	..	34·50	7·00	58·50	65·50

The amount of steam, then, introduced to the producer, varies very much; but it is always sufficiently plentiful in actual working.

The percentage of combustible elements in the gas is ordinarily from 33 to 40, exactly because the addition of water is important. With producers using only fairly pure coke, like the Liegel furnace, in which no water is employed other than that contained in the coke and air, this percentage frequently falls below 24. It can, moreover, be shown directly and practically which is the more advantageous to mixed gas (air gas + water gas), whether to be rich or poor in hydrogen. Take the composition of the gas from the Schilling bed of retorts (quoted by Bunte in the above table), and also from a Liegel setting. One hundred cubic metres of the first gas containing CO, 20·6; H, 15; CO_2, 8·6; and N, 55·8, have been formed by 15·661 kilos. of C. The heat stored in the bed is 87,753 calories for an outlay of 15·661 kilos. of C—that is, 5603 calories per kilo. of C out of 8080 calories. One hundred cubic metres of the second gas containing CO, 23·7; H, 0·55; CO_2, 8·70; and N, 67·05, have been formed by 18·366 kilos. of C. The heat stored in the bed is 69,541 calories for an outlay of 18·366 kilos. of C—that is, only 3786 calories per kilo. of C. Similar calculations applied to the analysis of the gas cited by M. Euchène would show the advantage of increasing the decomposition of steam. Contrary, therefore, to the opinions expressed by some leading engineers, being given that the concomitant production of CO_2 and CO cannot be avoided, it is of advantage to push the amount of steam as far as possible without any undue cooling of the producer.

In the Parsy producer, the "weir," which compels the steam to pass in contact with the coke, ensures its maximum decomposition. The addition of a considerable proportion of steam, while lowering the temperature of the active zone, slightly increases, other things being equal, the amount of CO_2. But as this results in a supplementary freeing of utilizable heat for the decomposition of a fresh amount of H_2O, this addition is finally advantageous, as has already been seen in the comparison of the two poor gases (Schilling and Liegel). It is not without use, then, to specify that the water ought to be vaporized before its entrance into the producer. If, instead of this, it is allowed to drop to a large extent into the bottom of the furnace, this tends to soak the contents of the ash-pit and cool the bottom of the furnace-chamber. The water is obviously vaporized in the producer, but largely escapes being split up, and the steam produced uselessly carries off heat.

The coke used is frequently very full of ash. When it is only calcareous, it forms dust. Ordinarily it forms numerous varieties of silicates, more or less fusible. The high temperature at the bottom of the fire-bars and towards the floor of the ash-pit is favourable to the accumulation of clinker at this point. Again, too intensive combustion, besides directly destroying the fire-bars and fire-brick walls, leads to the formation of compact, hard, and adhesive slag. On the contrary, when the air is sufficiently moist, the clinker formed is spongy, sticky, and friable after cooling. If there is only a slight excess of steam, a greater percentage of it, it is true, passes through the mass of coke without being decomposed, and uselessly carries away calories. But it often prevents the sticking of slag to the bars and walls. Inversely, too great flowing in of steam can stop the fall of clinker, and consequently cause the fixing of the fuel. Therefore, there cannot be an absolute rule in this respect; but the Parsy producer allows, in any case, of the decomposition of the maximum suitable amount of steam, according to the quantity and nature of the impurities contained in the coke, so that "it ensures the best practical reduction of the carbonic acid into carbonic oxide."

PROTECTIVE COATINGS FOR PIPES.

Value of Coal-Tar Products.

At the last meeting of the Illinois Gas Association, Mr. Robert B. Harper, the Chemist in charge of the testing laboratory of the Peoples Gaslight and Coke Company of Chicago, submitted a long paper dealing with the subject of "The Comparative Values of Various Coatings and Coverings for the Prevention of Soil and Electrolytic Corrosion of Iron Pipe." In the course of it, he made the following remarks on the subject of the value of coal tar and its products in this connection.

A comparison of costs of protective materials, with their general behaviour under all conditions, leads one to the conclusion that, all things considered, paints or dips containing coal tar or its products as a base furnish the most practical solution of pipe protection against soil or electrolytic corrosion. They appear to be the cheapest as well as the most efficient compounds, while other manufactured products, no doubt good in some cases, are prone to failure on account of their tendency to become brittle, and the apparent presence in them of small amounts of matter readily dissolved or decomposed by soil waters. Pure coal-tar pitches do not seem to contain any constituents which are at all readily dissolved; but, of course, they may be open to the objection of brittleness if not properly prepared.

Tar products usually cling to a pipe better than the majority of dips. Pitch also seems to be of all dips the least affected by oxidation. Its unchanging character in soil waters has been satisfactorily established in many cases. A very striking example of the durability of pitch is quoted from "Engineering News," in which it is stated that, after 32 years, pitch that had been used as a waterproofing over the old New York Central and Hudson River Railroad tunnel still retained its initial properties. Coal tar is a heterogeneous mixture of compounds, some of which must be removed before it is used as a base for coating pipes. It is also subject to considerable variation in composition; and any statements herein made are general, and apply to average conditions or compositions. The coal-tar pitches used in the test work described in the paper were said to be a mixture of the bye-products of more than a dozen different coal-gas plants. In the light of this fact, we must assume that the results obtained are what might be reasonably expected from an average coal tar or its products.

The discovery of an absolutely efficient material and method for preserving pipes from electrolysis seems to be only a remote possibility at the best. The writer feels that, were he to propose some good preservative and practical manner of coating service-pipe, he could not feel assured that it would do more than delay the ultimate corrosion of a pipe subject to the action of stray electrical currents. Even if the protective compound could withstand the strains naturally put upon it, it seems likely that in practice it would fail of its purpose.

The old saying, "A chain is no stronger than its weakest link," was never used more relevantly that when applied to a pipe coating or covering. Too much stress cannot be laid upon the necessity for the proper application of even a fair protective material. One bare spot in a line of apparently covered pipe only concentrates the whole corrosive effect of stray currents, and in reality probably causes a hole to form in the interior of the metallic body sooner than if the pipes had been uncovered.

As the result of an impartial consideration of all the preservative materials, their properties, costs of application, and behaviour under all conditions, the most practical and most efficient (if well applied) type of covering which suggests itself is that of a clean coal-tar pitch, free from water, acids, or soluble mineral matter. Such a pitch should be as hard as it is possible to make it without having a decided brittleness at ordinary temperatures. It should not crack when struck a hard blow. Pipes upon which such a coating is to be placed should be smooth, free from moisture, rust, and loose scale or foreign matter of any description. Burrs or other projections of metal should be filed down before coating pipe, as these, if left, would, when surrounded by wet soils, probably provide a means of egress for possible stray currents.

The clean pipe should be left in a melted bath of the pitch until the metal and dip are at the same temperature, which should be just sufficient to melt the pitch to a uniform liquid condition. The pipe, when removed, should have a smooth, uniform, black glossy coating, free from lumps, bubbles, or foreign matter. The film of pitch should have a thickness of at least 1-32nd inch to give a firm coating. If the coated pipe will be subjected to the likelihood of abrasions due to rough handling, it may be found profitable to wrap the cold coated pipe with an overlapping strip of a tough yet flexible paper, or even with a cloth strip (it was found that cloth or paper apparently remained in good condition when saturated or covered with coal-tar pitch containing no other foreign substances), and re-immersing the wrapped pipe in a slightly softer pitch only long enough to saturate and coat the paper or cloth. The object of this procedure would be to provide a flexible exterior coating to protect the harder underlying layer. Coal-tar pitch can also be used as a field coating.

The foregoing coating, if used, would probably cost for labour and material about the following amounts for covering 100 14-feet lengths of 2-inch pipe in a 10-hour day: 25 gallons of pitch, at 10 c. per gallon, \$2·50; 1000 yards of muslin cloth, 4-inch strips, at 85 c. per 100 square feet, \$8·50; labour, one man at \$2·25 and a helper at \$2, \$4·25—total, \$15·25. The labour and material would, therefore, amount to about 1 c. per lineal foot of covered pipe. Heat for melting the dip, inspection, and incidentals would probably make this up to 1½ c. per foot run.

The tar-coating mixture used by the Consolidated Gas, Electric Light, and Power Company of Baltimore consists of the following ingredients: 10 gallons of coal tar, 18 gallons of oil tar, 7 quarts of turpentine and crude rubber mixture, 5 lbs. of dissolved tallow, and 1¼ lbs. of resin. The crude rubber mixture consists of 2 lbs. of rubber dissolved in 7 gallons of pure turpentine. The directions for use are: Heat the mixture enough to get the ingredients thoroughly mixed, and use cold on street or field work. The mixture, made up according to the foregoing formula, was sufficiently thin to be applied cold by a brush. The specific gravity was 1·146. It gives a thin film, but does not seem to harden, even after several months from the time of application.

The following is the author's summary to his paper: After a careful consideration of each and all of the protective materials which were tested for their ability to prevent soil or electrolytic corrosion of iron or steel pipe, the following conclusions have been drawn. It is believed: (1) That paints, as a rule, do not prevent electrolysis, but some, no doubt, have a beneficial effect in curtailing soil corrosion. (2) That the appearance to the naked eye of a paint film is no indication of its permeability to water. (3) That corrosion of metal may take place beneath a paint film without apparently affecting its appearance. (4) That the metallic body before being covered must be smooth and free from rust, moisture, loose scale, and foreign matter, in order that it may be preserved. (5) That, in general, dips applied hot are better than paints, and probably furnish the key to the solution of the prevention of corrosion. (6) That concrete of itself is not an efficient protection against electrolysis. (7) That ingredients such as rubber, tallow, lime, &c., usually have a deleterious effect upon the efficiencies of coal-tar pitch.

HORIZONTAL, INCLINED, AND VERTICAL RETORT SETTINGS COMPARED.

By Dr. E. OTT, Chemist at the Schlieren Gas-Works, Zürich.

Last autumn Dr. Ott read a paper before the annual meeting of the Swiss Association of Gas and Water Engineers at Winterthur, in which he showed, on the basis of the prices prevailing then, that vertical retorts afforded a financial advantage over horizontal and inclined retorts. Investigations have been pursued by him since; and the results of these have been collected with the earlier results and embodied in a communication by Dr. Ott which appears in the "Journal für Gasbeleuchtung" of the 17th inst. The following is an abstract translation of this communication.

The apparatus of the experimental plant at the Schlieren works can be connected either to a special experimental setting of two horizontal retorts or to two of the vertical retorts in ordinary working. The object of these investigations was to study more closely the conditions of carbonization in the two types of settings, as particulars which have hitherto been published in regard to them are highly contradictory. The results obtained with the special setting of two horizontal retorts and those afforded in practical working with horizontal and inclined retort settings were known to be comparable.

The settings were first brought to the ordinary working heats. The temperature of the horizontal retort setting was taken in the arch by means of an automatically registering pyrometer. That of the vertical setting was taken through the two lowest sight-holes with a Wanners' pyrometer. The retorts used had always been scurfed a few days previously, and were sound. The vertical retorts received their usual charge—that is to say, they were filled to within 28 to 40 inches of the top. The horizontal retorts were charged with 100 kilos. (220 lbs.) apiece of the coal in its original state of moistness. This charge left a large free space in the retort; but as the gas did not show any deterioration of quality on this account, and the weight of charge was very convenient both for handling and for calculating results, it was adhered to. Scoops were used for charging. In order that the results might be strictly comparable, the charges were distilled to the same degree of exhaustion. In the vertical retorts they were drawn when the last hour's carbonization had yielded 350 cubic feet of gas. Corresponding to the smaller charge, the horizontal retorts were drawn when the last half-hour had yielded 70 cubic feet of gas. The makes of gas thus obtained were somewhat higher than the so-called working results, which are too vague and ill-defined to be of much utility for strict comparisons of different methods of carbonization. The figures, however, did not differ considerably from good working results. Provided that the weight of the charge and the heats remained unaltered, the time required for carbonization in the conditions adopted is a measure of the degree of ease, or rate at which the coal is carbonized. It thus affords an ultimate criterion of the amount of fuel required to be consumed in carbonizing each description of coal.

When steam was admitted into the vertical retorts, it was introduced for two hours after the carbonizing period had been completed. The amount of coke made in the vertical retorts was ascertained by weighing it after light quenching and allowing it to cool. The quantity of water contained in it and the weight of coke-breeze (dry) put into the retort before the charge of coal, were deducted. From the horizontal retorts the coke was drawn direct into barrows, which were immediately closed by a lid and weighed. The tar and ammonia were determined by flushing out the condensing and scrubbing plant, separating, and estimating the ammonia in the liquor. The make of gas was measured in an experimental meter, and a known proportion (about 7 per cent.) was passed into a small holder for the sake of obtaining a mixed sample, on which determinations of illuminating power and calorific value were made. Care was taken that the tests of coal and coke were made on good, average samples. Each coal was worked for at least a week in the same setting. The results of trials of three descriptions of coal, all taken as air-dried, are shown in Table I. The two temperatures recorded for the vertical retorts are those observed through the two sight-holes. Where the proportion of ash in the coal varied, the yields were calculated to a uniform basis in regard to ash in order to make them comparable.

It will be seen from Table I. that the make of gas with the vertical retorts, without steaming, is about 540 cubic feet per ton more than with the horizontals. The make, with steaming, naturally depends on the amount of steam admitted. The gas made in the vertical retorts, both with and without steaming, was below that made in the horizontal retorts, both in regard to its calorific value and illuminating power. The total calorific value and the total illuminating power obtained in the gas from a given weight of coal were, with the vertical retorts without steaming, below those obtained in the gas from the horizontal retorts. With steaming, naturally, the conditions became more favourable in regard to total yield of calorific power, but in regard to illuminating power, less favourable for the vertical retort. Reference is made towards the close of the paper to the question of the utilization of the total energy of the coal. The vertical retorts, without steaming, yielded 0·5 per cent. (by weight of the coal carbonized) more coke than the horizontal retorts; and it was of a firmer description. The yield and quality of coke with steaming naturally depended on the quantity of steam admitted. The yields of tar and ammonia were about the same for the two types of setting; but the tar from the vertical retorts was thinner than that from the horizontals.

TABLE I.—*Comparative Results of Carbonization in Horizontal and Vertical Retorts.*

Description of Coal.	Retorts.	Cubic Feet of Gas (at 60° Fahr., 30 inches, and Saturated) per Ton of Coal.	Net Calorific Power of Gas B.Th.U. per Cubic Foot.	B.Th.U. Net in Gas per lb. of Coal Carbonized.	Candles per 5·3 Cubic Feet of Gas Consumed per Hour in a Slit Burner.	Percentages by Weight.			Ash in Coal. Per Cent.	Temperature of Setting. Deg. C.	Admission of Steam.
						Coke.	Tar.	Ammonia.			
Saar coal "Camphausen" Washed nuts	Horizontal.	11,554	564	2910	10·3	69·0	6·28	0·223	9·7	1185	Nil.
	Vertical.	12,129	527	2854	7·0	69·1	6·15	0·212	,,	1335-1160	,,
	,,	14,102	493	3106	3·9	68·0	5·95	0·217	,,	1330-1160	2 hours.
Saar coal "Maybach" Washed nuts	Horizontal.	11,841	576	3047	11·8	67·9	5·80	0·249	8·0	1185	Nil.
	Vertical.	12,380	539	2981	7·3	68·1	6·25	0·209	,,	1335-1135	,,
	,,	14,461	488	3148	3·0	66·9	6·50	0·208	,,	1345-1140	2 hours.
Ruhr coal "Augusta Viktoria" As raised	Horizontal.	11,231	564	2828	9·1	71·8	5·80	0·306	11·1	1170	Nil.
	Vertical.	11,554	542	2794	8·4	73·0	5 20	0·315	10·3	1355-1125	,,
	,,	13,851	490	3029	3·5	70·8	5·12	0·299	9·3	1385-1130	2 hours.

Having regard to the fact that the vertical retorts yielded more gas and more coke than the horizontal retorts, and the gas represented a smaller heat value, the higher yield of gas cannot be explained simply by a better heating of the charge or a better gasification of the contents of the retort, as in that case the yield of coke would be smaller, and the heat transferred to the gas larger. It must, therefore, be due to a more thorough decomposition of the volatile constituents. This is quite conceivable if it is remembered that these constituents must stream upwards between the block of coke and the retort walls, coming thus into much more intimate contact with the hot walls than does the gas in horizontal retorts. The so-called free space in horizontal and inclined retorts appears to have no greater decomposing effect on the volatile constituents than does the narrow space in vertical retorts. The thinner character of the vertical retort tar seems to be due to some other cause than a less thorough decomposition of the volatile constituents. It is conceivable that a kind of filtration takes place in the tall slab of coke, whereby the solid particles of carbon are partially retained, and the tar thus becomes poor in carbon, or thinner. The heavy deposits of scurf in the vertical retorts also indicate a thorough dissociation of the hydrocarbons. There is thus every reason to assume that there is at least as thorough a decomposition taking place in the vertical retorts except for the one fact that less cyanogen and naphthalene are formed than in horizontal retorts. It is an open question what is the reason of this; but doubtless some explanatory facts will be ascertained in regard to it in the course of time.

When the experimental results are handled to show the financial advantages of one or other method of carbonization, figures from working on the large scale must be introduced; and a new and most important factor—viz., the amount of fuel consumed in heating the retorts—has to be taken into account. If the results obtained at all the Swiss gas-works are considered, it will be found that there is a fundamental difference in the yields of gas obtained per ton of coal. For instance, for the working year 1907-08, the make of gas varied at different works between 25 and 34 cubic metres per 100 kilos of coal (8970 and 12,200 cubic feet per ton). The fuel consumed in heating the retorts likewise varied from 12 to 38 per cent. of the weight of coal carbonized. This is due to a number of causes—such as the type of setting, the amount of ash in, and origin of, the coal carbonized, the heats, time of carbonization, working with or without exhausters or admission of air, the elevation of the works, &c. Hence it is difficult to make a critical comparison for the different works of the cost of coal per 1000 cubic feet of gas made; but for each works in turn it is useful to ask the question whether the yield of gas varies from year to year in proportion to the amount of fuel consumed in heating the

settings. If the question is answered in the negative, it may be inquired by what means an economical equilibrium can be established between the yield of gas and the fuel consumption. It may be by changing the description of coal carbonized, or by better supervision of the furnaces, or what not.

It is not right to aim at a larger yield of gas per ton of coal to the neglect of the amount of fuel consumed in the furnaces, as the latter may often negative a high yield of gas. On the other hand, too much stress must not be laid on the consumption of fuel being very low, because it may be due to the coal not being completely exhausted of gas. With a particular setting, a particular coal, and a particular method of working, an increase in the yield of gas obtained, either by higher heats or by more prolonged carbonization, should correspond with an increase in the amount of fuel consumed. As, however, the yield of gas tolerably quickly attains a maximum limit, while the consumption of fuel may rise indefinitely, it is of interest to ascertain about what increase in fuel consumption should correspond to a certain increase in the make of gas, and, conversely, assuming that there is no loss in either direction. Bearing these facts in mind, Table II. has been drawn up in regard to the conditions prevailing in Switzerland.

It will be seen that, according to this method of calculation, the

TABLE II.—*Net Cost of 1000 Cubic Feet of Gas at Swiss Gas-Works.*

Taking coal and coke at £1 6s. 10d. per ton; tar, at £1 2s. per ton; and ammonia, at £1 14s. 6d. per cwt.

——	Horizontal and Inclined Retorts.				Vertical Retorts.	
					Without Steam.	With Steam.
Make of gas (at 60° Fahr., 30 inches and saturated):—						
Cubic metres per metric ton	290	300	310	320	340	385
Cubic feet per ton	10,406	10,765	11,124	11,483	12,200	13,815
	Pence.	Pence.	Pence.	Pence.	Pence.	Pence.
Cost of coal, less value of residuals, per 1000 cubic feet of gas	6·1	6·0	5·8	5·6	4·1	4·1
Cost of retort-furnace fuel, per 1000 cubic feet of gas, when the coke consumed amounts to the percentage of the weight of coal carbonized stated:—						
14 per cent.	..	10·2	9·8	9·5	8·1	..
15 ,, ,,	..	10·5	10·2	9·8	..	7·8
16 ,, ,,	..	10·8	10·4	10·1	..	..
24 ,, ,,	13·6	13·2	..	..	..	..
25 ,, ,,	14·9	13·4	..	..	..	..

cost of 1000 cubic feet of gas is practically the same whether the make of gas is 10,400 cubic feet, and 24 per cent. of coke is consumed in the furnaces, or whether the make is 10,760 cubic feet and 25 per cent. of fuel is consumed. Or, it is the same whether 10,760 cubic feet of gas are made and the fuel consumed is 14 per cent., or whether 11,125 cubic feet are made and 15 per cent. of fuel is consumed, or whether the make is 11,480 cubic feet and the fuel consumed is 16 per cent. In other words, if the economy of working is regarded, an increase of 1 per cent. in the fuel consumed must correspond with an increase in the make of gas of about 360 cubic feet per ton, and *vice versâ*. Generally, however, when an increase in the yield of gas is aimed at, an increase in the economy is also expected; and therefore an increase in the fuel consumed of 1 per cent. should be accompanied by a greater increase in the make of gas than 360 cubic feet per ton. In other words, an increase of 360 cubic feet per ton in the make should be attained with an increase of less than 1 per cent. in the fuel consumed. Naturally, other prices and other proportions of make per ton of coal affect the absolute results, but will not greatly affect them relatively to one another.

The question may now be considered whether it would be advantageous, if feasible, to stop at a low yield of gas and a low consumption of fuel. Among the advantages presented would be the saving of material of the setting by working at more moderate temperatures, and the gain in the heating value of the gas. Another question which at once arises is as to how the yield can be increased while maintaining the same consumption of fuel. Means which suggest themselves for this purpose—assuming that the methods of working are correct—will be, principally, the changing of the coal and of the type of setting, in regard to which naturally the cost of the changes must not be left out of account in their effect on the final price of the gas. The gas-works at Zürich are in the fortunate position that, by changing the type of setting—that is to say, by the erection of vertical settings—they have achieved a considerable increase in the make of gas without any increase of fuel consumed. According to the last statistics, the yield of gas amounts to 10,898 cubic feet per ton with a consumption of coke of 14 per cent. These figures refer to a mixture of various coals—some Saar, some Ruhr, and some English. Comparing these figures with those given in Table II., the result must be considered satisfactory.

A comparison may now be instituted with the results of the existing inclined retorts at the Zürich Gas-Works for Saar coal, similar to that on which the trials were made in the vertical retorts. These trials afforded in vertical retorts without steaming 12,200 cubic feet of gas per ton, a yield of about 70 per cent. of coke, and a consumption of fuel of 14 per cent. With steaming, however, the make of gas from the same coal was 13,815 cubic feet per ton with 15 per cent. of fuel consumed. According to Table I., the horizontal retorts gave about 540 cubic feet less gas per ton and about ½ per cent. more coke. But for the inclined retorts under works' conditions, the comparative figures are about 720 cubic feet less gas per ton, and the same yield of coke. The carbonization in inclined retorts is, therefore, less good than in the vertical experimental retorts. The figures to be taken for the inclined retorts are thus a make of 11,483 cubic feet per ton of coal, a yield of 70 per cent. of coke, and a consumption of 14 per cent. of fuel for Saar coals. The experience at Zürich shows that the same figures may be taken for the yields of tar and ammonia. It is assumed that when steam is introduced into the vertical retorts, the water gas is made at the expense of the carbon of the coke, and not from the scurf, because the former is much more porous and more easily attacked. The vertical retort coke must be valued at a higher price than that from the inclined retorts. It is taken at 1s. 7d. per ton more, though at the present time this difference is exceeded.

It will be seen from Table II., that the vertical retorts compared with inclined retorts with a make of 11,483 cubic feet and 14 per cent. of fuel consumed, show an economy per 1000 cubic feet of gas of 9·5d. − 8·1d. = 1·4d. The much higher yields in vertical retorts are attained by reason of the more thorough decomposition of the gas and the more prolonged heating of the outside of the slab of coal. Large carbonizing chambers display similar conditions, and give a still higher make of gas. Unfortunately, however, no figures for fuel consumption with these are available; so that considerable uncertainty prevails as to the actual results attained. The better result shown by the vertical retorts is not affected by the higher cost of installation, as this cost remains the same for settings and retort-house per 1000 cubic feet of gas made. The result, however, is improved by the reduction which the vertical retorts affect in wages. Working without steam, the wages per 1000 cubic feet of gas made come out at 0·42d., compared with 1·36d. in the old retort-house, or an economy of 0·94d. per 1000 cubic feet. Together with the saving in fuel consumed, of 1·4d. per 1000 cubic feet already referred to, the reduction in wages affords a total reduction of about 2·4d. per 1000 cubic feet, which on a make of about 500 million cubic feet per annum will amount to about £5100.

The results are still better, if after carbonization is completed, steam is passed into the bed of coke to form water gas.* The make of gas becomes 13,815 cubic feet per ton. Some carbon naturally is expended, as the yield of coke falls about 1½ per cent. The economy in fuel consumption, over inclined retort working, is 9·5d. − 7·8d. = 1·7d. per 1000 cubic feet, in arriving at which figure the cost of the steam has been taken into account. The wages, on the same basis as before, come to 0·39d., which is a saving of 1·36d. − 0·39d. = 0·97d. over the inclines. The total saving is therefore about 2·1d. per 1000 cubic feet, which, on a make of mixed gas of about 550 million cubic feet per annum, amounts to about £6250. In this calculation, as in that for the vertical retorts without steaming, no allowance has been made for the reduced consumption of oil in the naphthalene washers and of ferrous sulphate in the cyanogen extractors, due to the lower proportions of naphthalene and cyanogen in the vertical-retort gas. Also it should be remembered that, apart from the saving in wages, the labour in the retort-house is lightened by the adoption of vertical retorts. For other coals than Saar coal, the make of gas and other conditions will be different; but the relation of the figures to one another will remain unaffected.

The question whether there is a greater advantage in the manufacture of water gas in independent generating plant than in producing it by admitting steam to the vertical retorts could not be gone into, because there is no water-gas plant at the Zürich Gas-Works. To elucidate it, however, the figures for

working without admission of steam have been ascertained and included—notwithstanding that at Zürich it is now more advantageous to work with steaming than without it.

In judging the economy of retort plant, the make of gas is of more importance than its quality, because the gas is sold per 1000 cubic feet, and not by calorific value or illuminating power. If, however, the energy available is regarded, the aspect of the matter is altered. Considering first the relation of the energy made available in the gas and coke to the total energy of the coal carbonized, it is still true that 1 per cent. increase in the fuel consumed is equivalent to an increase in make of about 360 cubic feet per ton. A simple calculation shows that, if the calorific power of the gas is the same, the increase in heating value of the total make of gas is less by about 140,000 B.Th.U. than the extra heat supplied by the increase of 1 per cent. in the furnace fuel per ton of coal carbonized. There would thus appear to be a greater expenditure of energy in producing the increased yield of gas than is warranted by the result. In order to adjust this difference, it would be necessary that an increase of 1 per cent. in the consumption of fuel should be attended by an increase in the make of about 540 cubic feet per ton of coal. If we add together the total energy (heating value) of the gas and coke produced, and deduct the energy of the coke consumed in the retort-furnaces, all per ton of coal carbonized, we arrive at the following figures for the total energy available for sale in the coke and gas, for the different methods of working: Horizontals, with 14 per cent. fuel consumption, 22,241,722 B.Th.U.; verticals, without steaming, with 14 per cent. fuel consumption, 22,389,696 B.Th.U.; and verticals, with steaming, with 15 per cent. fuel consumption, 21,838,118 B.Th.U. The energy that is rendered available with the verticals without steaming is 0·6 per cent. greater than with the horizontals; but with the verticals with steaming it is 1·8 per cent. less. Owing, however, to the increased fuel consumption for the steaming having probably been taken on too low a basis, the figures found for the verticals with steaming are no doubt too favourable. There is, however, in the latter case the loss of energy in the formation of water gas; so that the actual heat efficiency of the plant may be better.

The calorific value of the gas has naturally, per cubic foot, been reduced (as has also the illuminating power; but this is of less importance, and may be disregarded). It should be considered, however, that the expenditure on raw materials, wages, salaries, &c., has increased of late years enormously; that the price of gas has been lowered and can scarcely be raised again; and that the depreciation in calorific value at Zürich is only about 6 per cent. Bearing in mind the general disposition to reduce the calorific power of gas, it may be said, on behalf of those financially interested in gas undertakings, that gas-works are making the reduction in obedience to necessity, and not of their own accord.

TESTS OF BREEZE CONCRETE.

The occurrence of failures of concrete composed of portland cement and breeze, caused by expansion of the mass, resulting in more or less serious consequences to the structure of which it formed part, led Mr. D. B. Butler, Assoc.M.Inst.C.E., to carry out a number of investigations on the subject, the results of which he recently communicated to the Society of Architects in a paper, of which he has sent us a print.

The failures to which the author gave his attention generally occurred where the concrete had been used to form flat roofs, or fireproof concrete floors, on the well-known embedded rolled joist system of construction. In some instances, the expansion was but slight, though noticeable; whereas in others it was sufficient to push out the brickwork walls, causing serious bulging, and endangering the safety of the whole structure. Careful investigation of some of these causes of failure justified the opinion that the mischief lay with the cement; but nothing definite was disclosed. In nearly all the samples of so-called "breeze" concrete, however, a considerable quantity of material other than pure coke—such as clinkers, stones, shale, ashes, and even small coal—was noticeable in the aggregate.

The question consequently arose whether either coke breeze or coal was in any way dangerous as being likely to cause expansion of the concrete; and experiments were undertaken with the object of arriving at a conclusion on the point. The first experiment was carried out with an ordinary bituminous house coal, which was crushed and sifted to about the fineness of standard sand, and with this a 3 to 1 mortar was made. With the mixture there were filled two small 2-oz. glass bottles, one of these being made quite full, while the other was filled to within ¼ inch of the top, and was sealed down with a plug of neat portland cement. For comparison, a similar bottle was filled with a paste of neat cement and 3 to 1 mortar of standard sand. Sixteen cements were tried, and the whole of the bottles eventually cracked, with the exception of one which was filled with standard sand-cement mortar.

The next step was to test samples of so-called "breeze" from various sources. Several samples of good breeze were procured, as well as some which the author was assured by the merchant would never be sanctioned by a good clerk of works. With all the samples tested, the general method adopted was to separate them into heir several fractions or constituents so as to be able to identify, if possible, the cause of any expansion. Each sample was therefore separated as follows: (1) The fine material passing through a 1-10th inch sieve; (2) the fine material passing through a ¼-inch sieve, but retained on a 1-10th inch sieve; and (3) the coarse material retained in a ¼-inch sieve, which was picked all over by hand and separated into its constituents. A record of each fraction was kept, and each fraction was broken up so as to pass through a 1-20th inch sieve; and two cements of known stability of volume were used.

The bottle test already referred to was somewhat crude, and qualitative rather than quantitative. In order, therefore, to render them more accurate and of a quantitative nature, the subsequent experiments with coke breeze mortars were made with prisms, 100 mm. long and 22 mm. by 22 mm. cross section, the expansion and contraction of which were accurately measured in a Bauschinger micrometer caliper apparatus, by which a variation of 1-200th of a millimeter in the prism could be detected with certainty. Eight prisms were made with each kind of cement; neat cement being used in four, and 3 to 1 standard sand-cement mortar in the remainder. Two of each series were kept entirely in air, and two placed in water after 24 hours, and kept therein for three months. The tests on these bars showed that the expansion under water was very small; while the bars kept entirely in air showed a slight contraction.

The first test with breeze was with a quality described as "fine pan breeze," consisting mainly of clinker and coke, with only traces of coal. Though the expansion was measurable, it was practically negligible in each case—being about 0·1 per cent. The air bars, as with the standard sand bars, generally showed slight contraction. The second sample, described as "coarse pan breeze," consisted of coke and clinker only; and when treated in an exactly similar manner to No. 1, the results were again practically negative. The third sample consisted of coke and clinker with a little coal; the coke varying from 2 inches diameter to fine dust. The results again were mainly negative; as were those of the fourth sample (furnace ashes). A sample described as "gas-works clinkers" consisted of clinkers only, ranging in size from 4 inches diameter downwards. They were crushed to pass a 1-20th inch sieve, and tested in the same way as previous samples, with like results.

Attention was next directed to samples of breeze which the contractors supplying them described as "sometimes used for floors, but which they neither used nor recommended." A sample consisting of ashes or furnace refuse contained a considerable quantity of coal; whereas one described in precisely similar terms contained none. It did not, however, appear to have exerted any deleterious influence upon the specimens, probably due to its being of an anthracitic rather than of a bituminous nature. A sample described as "coal ash straight from the furnace of paper-mills, burnt from coal only," contained a considerable quantity of clinkers. Though the specimens left entirely in air developed little or no expansion, all the fractions except the coke and clinkers showed rather marked expansion in water; the coal being very much the worst. Some coal and coke ashes dropped from the fire-bars of furnaces in water-works were tested, with the result that the water-test bars from all the fractions showed enormous expansion within the first three or four days, and subsequently swelled so much as to break, and render further measurements impossible. The special value of the results obtained with this particular sample of breeze is that it shows clearly that some kinds of ashes and furnace refuse are more dangerous than coal.

A noticeable feature of the foregoing experiments is that many of the specimens which show very marked expansion when they are placed under water as soon as set, expand much less when left entirely in air. It therefore seemed a point worth determining as to whether exposure to damp or moisture would in any way affect these air-set specimens at the end of the three-months tests—*i.e.*, after they had become thoroughly seasoned. One of the duplicate air bars from each series was therefore placed under water; the time elapsing between the date of moulding and placing under water ranging from 91 to 292 days. The results proved that immersion had practically no effect upon the specimens which had previously shown no expansion when kept under water, but that it caused almost immediate expansion of a very serious nature with the fractions of breeze which had previously developed expansion when placed under water in the first instance. This clearly demonstrates that the expansive agent, whatever it may be, is more or less dormant in the dry air-set block, and only requires to become damp to constitute a serious element of danger.

Referring to the chemical aspect of the question, it was intended, when the experiments were first commenced, not only to analyze each fraction of each sample, to ascertain if it contained any deleterious constituent, but also to analyze each mortar, both immediately after gauging and again at the end of the experiments, to try to ascertain, if and when any expansion had occurred, whether there was any marked chemical difference between them which would enable the cause of the expansion to be detected, and thus serve as a guide in the investigation of the actual cases of failure. After analyzing some 36 samples with entirely negative results, the idea was abandoned as involving too prodigious an amount of labour without any likelihood of corresponding reward. Seeing, however, that some of the coal fractions caused enormous expansion, while others caused practically none, they were examined chemically, with the view of ascertaining the cause of the marked difference. The results showed that the coals from

two samples were highly bituminous, containing 35 and 33½ per cent. respectively of volatile matter; while those from two other samples were more of the nature of anthracite, containing only 4 and 3 per cent. respectively of volatile matter. This indicates clearly that bituminous coal is highly dangerous, while anthracite appears to be harmless.

Taken as a whole, Mr. Butler says the experiments, so far as they go, seem to point to the fact that, as regards subsequent expansion, there is not much danger to be apprehended from good clean coke or clinkers, or even anthracite coal; but that some kinds of ashes and furnace refuse are highly dangerous, while any considerable quantity of bituminous coal is absolutely fatal. One noticeable feature of the experiments, however, was that most of the coke breeze mortars had a tendency to attack more or less seriously the iron moulds in which the Bauschinger bars were made; causing them to rust during the short space of 24 hours between the moulding of the specimens and their removal from the moulds. The author is not aware whether such results have been found to any appreciable extent in actual practice; but samples of breeze concrete sent to him for examination showed distinct marks of considerable rusting having taken place where the concrete had been in contact with rolled joists. He says that if such prove to be the case, it might in the end be a very serious matter as effecting the life and strength of the steelwork.

The experiments described in the paper represent some two years' work, and include the preparation of about 300 test-pieces involving some 5000 measurements, to say nothing of the sifting, sorting, and preparation of the breeze samples. The author says he is only too conscious of the fact that the experiments are far from reaching finality; indeed, they only touch the fringe of a wide field of research, in which there is a vast amount of work to be done. Having ascertained, however, that certain materials constitute a serious source of danger, and probably account for many of the failures of breeze concrete met with, he trusts the "danger-signals" which he says are unmistakably displayed by his researches may prove of value, and tend to prevent the recurrence of such accidents in the future.

In conclusion, Mr. Butler gives an extract from the "Tonindustrie Zeitung" to show that the subject he has been dealing with has begun to be appreciated in Germany. The extract sets forth that the Minister for Public Works issued, on March 25, 1908, a circular, of which the following is a free translation, addressed to the Presidents of the Government:

> After having received the report of the German Board on reinforced concrete, I recommend the prohibition of the use of breeze as an aggregate for concrete for the erection of reinforced concrete buildings in general, also in ceilings and beams wherever tensile stresses may occur. The use of breeze for other kinds of concrete will only be admitted in such cases where there is no danger of its coming into contact with the supporting ironwork, nor of people being hurt by the falling concrete.

It only remains to mention that the tests carried out by the author are fully described, by the aid of diagrams, in his valuable paper, which is given in full in the "Journal" of the Society to whose members it was submitted.

REINFORCED CONCRETE RESERVOIR ACCIDENTS.

Since the beginning of the year, two accidents have occurred to reinforced concrete reservoirs in Oklahoma, which have attracted considerable attention from local engineers. These happened at Guthrie and Oklahoma City, the principal cities of the State. In one case, the engineer who prepared the plans has frankly stated that in an attempt to secure maximum economy he went too far, and employed sections lighter than were safe. In the other case, the responsibility for the accident will need to be determined by the Courts. The following particulars are given by "Engineering Record."

The recently completed basins at Oklahoma City were designed by Mr. W. C. Burke, the City Engineer, and constructed under his supervision. The main basin was approximately 200 feet long, 80 feet wide, and 12 feet deep. It had three division walls running lengthwise of the basins, making four compartments of equal size. These division walls were intended to be of sufficient strength to hold water in any one compartment while the others were empty. It was intended that, one being filled, water would flow by a system of weirs to the others. The walls of the basins are of reinforced concrete, 12 feet in height, 15 inches thick at the bottom, and 6 inches thick at the top, reinforced by corrugated iron bars.

Water was not turned into the basins until about two months after their completion. Earth partly saturated with water banked against the outside walls caused a bend in them of about 6 inches. Though not required by the original plans and specifications, the Contractor added 12 inch square reinforced concrete pilasters running 9 feet high, and spaced about 30 feet on centres along all the walls. Water was turned into the east compartment on April 15; and just as the compartment was filled and the water was beginning to weir over into the second chamber, the division wall gave way. The collapse was almost instantaneous throughout the length of the wall; an eye witness describing it as falling all at once and being pushed outward by the water. About 15 feet of the wall at one end remains intact, showing no evidence of the division wall pulling away from the end walls. The concrete was a 1 to 2 to 4 mixture. Ada portland cement was used; and frequent tests showed it to be uniform and satisfactory. The stone was a hard, blue limestone. The concrete was mixed rather wet with a mechanical mixer, and deposited by elevating it to the top of a tower, from which it slid by gravity through shoots to places along the walls.

From the very slight thickness of the walls, it is evident that much dependence was placed on the reinforcing rods, which are placed in two rows, 2 inches from each face. The vertical rods on each side are ¾-inch corrugated, spaced 6 inches apart; the rods being 6, 9, and 12 feet in length, and all bent at the bottom so as to run into the floor from 6 to 12 inches. The horizontal ¼-inch rods were spaced about 15 inches apart. Extra ¼-inch rods, 6 feet long, extending 3 feet into the end wall and 3 feet into the main wall, tied the two walls together. At the bottom of the collapsed wall, spaced 12 inches apart, were ¼-inch rods bent up into the wall about 18 inches; both ends extending into the floor of the basins.

The 3-inch wash-water pipe, with branch tees, carried lengthwise of the wall 3 feet from the bottom, doubtless had a weakening effect on account of the small cross section of concrete. The foundation of the wall was only 6 inches deep and 3 feet wide; thus offering little resistance against overturning. The weight of the wall was entirely inadequate to resist any overturning effect; and the bottom or concrete floor, being only 6 inches thick with ¼-inch rods spaced 24 inches on centres, was also of little help in this direction.

The City Engineer exonerates others from blame—saying that "in his attempt to construct the sedimentation basin with the money at the disposal of the Board of Water Commissioners for the purpose, he reduced the inner walls of the sedimentation basin to the minimum thickness which, in his opinion as an engineer, would carry the weight, and that he constructed the walls too thin."

The second accident was on the 20th of January, when water was turned into two new reinforced concrete settling-basins built under contract for the city of Guthrie, in accordance with the plans of the W. K. Palmer Company of Kansas City. The basins cracked at the corners. The water was turned out, and the repairs for the basins have lately been completed. The manner of making the repairs was to tie the corners together by rods and bolts, then fill in the corners with concrete, and strengthen them by building reinforcing piers or abutments. The original basins had but little earth backing around the walls; depending almost entirely upon the strength of the reinforced walls to hold the water. The basins were 35 feet by 80 feet, separated by a division wall 12 inches thick. They were 13 feet deep at one end and 17 feet deep at the other. The slope was apparently intended to facilitate an easy cleaning of the basins. The outside walls were reinforced by 12-inch buttresses placed on 10 feet centres. The plans of the outside walls show a reinforcing of ½-inch plain bars on 12-inch centres horizontally and vertically, though the specifications permitted the contractor to use any other form of reinforcing of equal section. They omitted any mention of special reinforcing at the corners of the basins where the walls pulled apart. The reinforcing rods did not sheer or pull apart, but slipped in the concrete.

The Gaslight and Coke Company's Bill.—The Committee of the House of Lords, presided over by Lord Clifford of Chudleigh, yesterday passed the preamble of the above Bill. A report of the proceedings before the Committee will appear next week.

Pumping with Compressed Air.—Pumping artesian wells with compressed air instead of a steam-operated system of pumping has effected a great reduction in the cost of fuel at Bradford (Pa.), according to the last report of the Water Board. The city authorities purchased and installed a 75 H.P. gas-engine and air-compressor. The cost of fuel per day when pumping water by steam had been $7·20; but with the gasoline-driven air-compressor, it was only 60c. Other advantages claimed for the newer system were that it could be started at a moment's notice, and that no expense was incurred for repairs.

The Late Alderman Aaron Edwards.—The funeral of the late Mayor of Longton (Alderman Aaron Edwards, J.P., C.C.), whose death was recorded in the "Journal" last week, took place on the 12th inst., amid manifestations on all hands of the honour and respect to which his civic position and long service entitled him, and marked by the deep sympathy evoked that his decease had occurred at the crowning point of a distinguished and unique public career. The whole town was in mourning; business premises being closed during the time of the interment. The family mourners and a number of invited friends met at Lansdowne House, the residence of the deceased, whence they proceeded with the remains to Zion United Methodist Chapel, with which place of worship the late Mayor had been associated from his boyhood, and during the last half-century in an official position. The procession was the longest and most representative ever seen in the town; and it commanded the attention of thousands of spectators. Among the borough officials present was Mr. W. Langford, the Engineer of the Gas and Electricity Departments of the Corporation. From the chapel, where the first part of the Burial Service was read, the body was conveyed to the cemetery at Dresden, where the concluding rites were conducted by the Vicar (Rev. R. M. Thompson). The deceased was interred in the family grave. Among the large number of floral tributes was a wreath from the officials of the Longton Corporation.

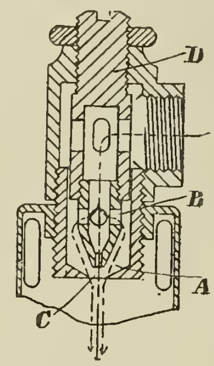
REGISTER OF PATENTS.

Regulators for Bunsen Burners.

Main, R. B. & A. P., of Falkirk.

No. 12,837; June 16, 1908.

These regulators for bunsen burners used for incandescent lighting and for heating purposes are of the kind wherein "a central jet-nozzle is used to give a minimum supply of gas at constant velocity, and acts in conjunction with an annular and co-axial nozzle to give a variable supply of gas at constant velocity."



Main's Regulator for Bunsen Burners.

As shown, the valve of the regulator is made tubular, formed solid at its outer end, and provided with lateral openings in the tube for the admission of the gas which passes directly inwards to the central jet as heretofore. The gas from this central jet joins that from the annular jet A, thus forming a stream of gas flowing at constant velocity. To provide for the passage of the gas to the orifice A, lateral openings B are formed (as usual), at the neck or in proximity to the conical end of the valve, and through which openings, when the valve is opened, the gas passes outwards and flows in an annular stream through the orifice C in the end of the casing, which is more or less closed by the conical valve point.

The solid outer end of the valve-stem may be screw-threaded as at D, and be turned in a correspondingly threaded portion of the casing to move the valve endwise to open or close it, and may be secured in any desired position by a lock-nut or the like; or the valve may be actuated by a cam or eccentric or like device operated from the side of the casing.

The patentees call special attention to the fact that with this arrangement the extremity of the central jet-nozzle is adapted to pass through the outlet orifice of the annular co-axial nozzle, which latter affords a seat at the edge of the orifice for the central jet-nozzle acting as a conical valve. This feature differentiates the present invention from prior constructions of the type in which the gas passes to the annular jet-orifice through lateral openings from the central jet.

Coin-Freed Gas-Meters.

Glover, T., of Queen Victoria Street, E.C.

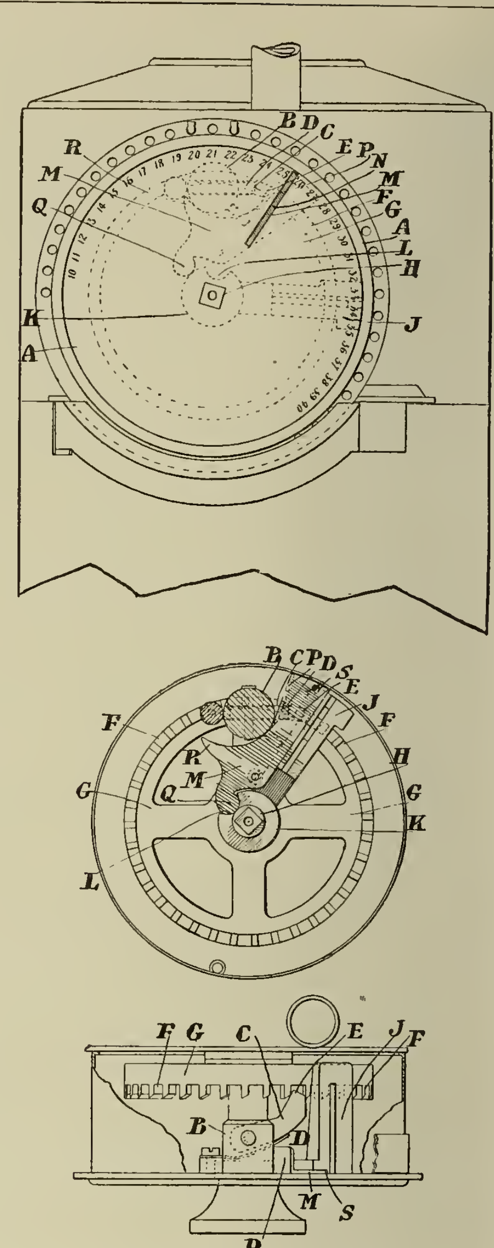
No. 15,922; July 27, 1908.

This invention relates to apparatus (patent No. 25,272 of 1894) in which the coin forms the connection between a coin pocket or receiver operated by a handle and a toothed wheel on the operating shaft, and (patents No. 14,197 of 1895, No. 2461 of 1897, No. 19,081 of 1901, and No. 13,367 of 1902) in which appliances are employed to prevent the toothed wheel being moved by any instrument except a coin.

The illustrations show an elevation of a portion of a gas-meter with the proposed appliances indicated in dotted lines; also a similar view with the front plate or price-changer removed, and a plan with part of the casing broken away.

On the back of the price-changer plate A (or it may be a fixed wall) is a stud or lug B carrying a pawl C controlled by a spring D, with its nose E normally kept in contact with the teeth F of the operating wheel G. On the axle H of the coin pocket or receiver J is formed a ring K, having a curved recess L in its edge; and between the lug B and the coin-pocket axle H is pivoted a plate M, of a shape and size to cover the coin-slot N in the price-changer or fixed plate, and actuated only by the coin pocket or receiver. The plate is provided with an upturned lip or wall P, which engages under the pawl C to prevent it being freed from the wheel G while the coin-slot in the price-changer is open. It is also provided with a curved nose piece Q, which engages the groove of the ring K surrounding the axle of the coin receiver; and it is further provided with an extension piece R, which engages the lug on the price changer plate and limits the movement of the plate. The plate is kept close to the price-changer by an arm of the lug, which prevents it being forced inwards by a tool. The arm of the coin receiver J is recessed at one edge S to engage the plate.

Now, supposing the coin receiver to be down, and the plate covering the coin slot as shown by the dotted lines, the extension R of the plate is engaging the lug B and the curved nose Q; the ring or wall K round the axis of the coin receiver being thereby held firmly and prevented moving in either direction. The coin receiver is now turned round by its handle until its recessed edge S comes against, and engages, the plate. During this movement, the nose of the plate has been engaged by the ring or wall around the coin receiver axis; but so soon as the coin receiver engages the plate, the recess in the ring around the axis is opposite (or nearly opposite) the nose of the plate, so that any further movement of the coin receiver will move the plate and uncover the slot N—this movement causing the nose of the plate to enter the recess in the ring, and the upturned lip or wall P of the plate to be positioned under the pawl C, so as to prevent it being moved from engagement with the teeth F of the operating wheel G. Thus any attempt to move the operating wheel by an instrument being passed through the slot N and coin receiver J is obviated.



Glover's Coin-Freed Gas-Meter.

On a return movement of the coin receiver, the edge of the recess in the ring K will act upon the nose of the plate and cause it to follow the coin receiver and remove the wall or lip P from under the pawl C and close the coin slot in the price-changer plate A; the plate M being held in the placed position by its nose Q riding on the ring K, as before stated.

Gas-Stoves.

Flowers, S., of Richmond, Surrey.

No. 17,599; Aug. 21, 1908.

This invention relates to an improved construction of gas-stoves, designed principally to facilitate cleaning; the walls of the stove and oven being "entirely removable, so that ready access can be gained to all parts."

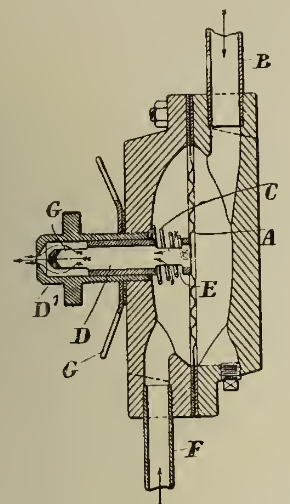
The walls themselves are preferably made each of two enamelled iron plates, or of a single plate bent on itself, having a layer of non-conducting material between—the plates and the non-conducting layer being fixed together in a permanent manner. A framework is then provided having iron posts at each corner; and the plates forming the back and sides of the stove are arranged to fit in between, or against, these posts, while the plate forming the front fits in the door. In one construction, the sides and back are formed as panels fitting into the framework and having fasteners at the corners which can be turned to hold the panels in place in the frame. In another construction, the back plate is arranged to slide down between the corner pieces of the frame, and the corner pieces do not extend along the sides, so that the side plates can then be made of the full width or depth of the oven.

Regulators for Gas-Heated Steam-Radiators.

Main, R. B. & A. P., of Falkirk.

No, 18,581; Sept. 4, 1908.

The novelty of this invention is shown by the accompanying illustration, wherein the usual diaphragm or corrugated disc A, actuated by the pressure of the steam or water which may enter by the pipe B, acts directly, against the action of a spring C, upon the inner end of the central jet-nozzle D of a regulating injector of the kind described



Main's Regulator for Gas-Heated Steam-Radiators.

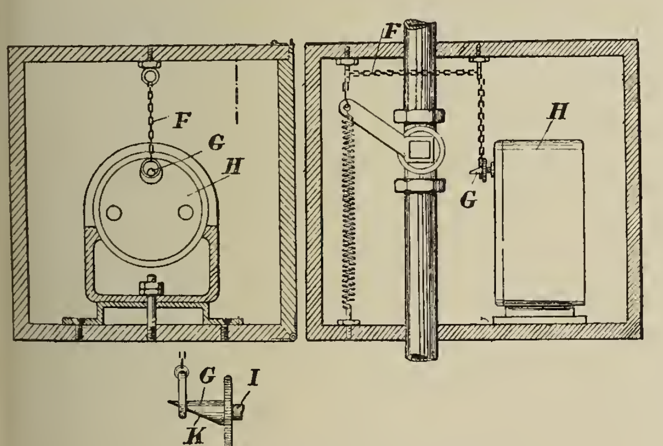
n patent No. 12,837 of 1908. The nozzle is arranged to give a minimum supply of gas at full pressure and constant velocity, and to act in conjunction with a co-axial jet nozzle D[1] to give a variable supply of gas. The outer nozzle (which for part of its length is screw-threaded for the purpose of adjustment) is secured to the casing to which the diaphragm and gas supply pipe F are attached; the gas supply passing to the central jet nozzle D by openings E, and to the outlet of the nozzle D[1] by other openings G. The injector, having a minimum supply orifice through which the gas flows at full pressure and constant velocity, "ensures perfect gas and air admixture"—risk of firing-back being also avoided; while the variable orifice of the nozzle D[1] allows of regulation to the required extent without interfering with the gas connection.

Time-Switches for Gas or Water Cocks or Valves.

Raasch, A., of Kiel-Gaarden, Germany.

No. 27,207; Dec. 15, 1908.

The invention consists in the provision of an angularly cut releasing stud connected with the alarm shaft of a clock and normally retaining a ring fixed to the end of a chain, the other end of which is attached to a spring-controlled switch arm, in such a way that while the chain ring is retained by the stud the switch will be in the open position. Then, at a predetermined moment, the clock-alarm comes into action, and its shaft turns the stud so that the chain-ring automatically slides off the stud and enables the switch to be reversed by its spring.



Raasch's Time Switch for Gas-Cocks.

The time switch applied to a gas or water conduit is shown by way of example.

The tap is furnished with an arm to which is connected one end of a spring rigidly secured at its other end to (for instance) the floor of the casing which encloses the entire arrangement. The arm is further connected to a chain F, which leads to, and can be retained by, the stud G of the clockwork H. This stud is fitted on the winding arbor I of the clock, and turns with it in the usual slow manner. The stud is cut angularly at K.

With the open position of the tap as shown in the second figure, the spring is retained by the chain F, which has a ring adapted to be kept by the lower straight side of the stud G. When the arbor I and stud G have turned sufficiently through the action of the clockwork, the angular surface K of the stud allows the ring of the chain to slip off, whereupon the spring closes the tap.

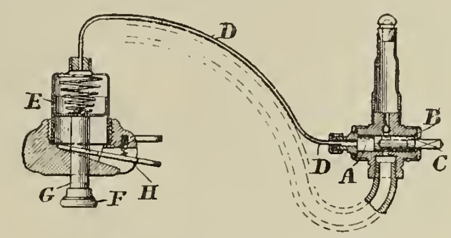
Controlling from a Distance the Supply of Gas to a Gas-Burner.

Fincke, F. O. H., of New York City.

No. 24,901; Nov. 19, 1908.

This invention relates to apparatus of the kind in which a piston-valve, mounted transversely of the gas-conduit in a casing, is adapted to be operated by an air-pump, so as to shut or open the latter to the passage of gas. The invention particularly relates to the gas piston-valve casing, "which is constructed of a plurality of co-axially arranged cylindrical members so as to be adapted to be easily made and finished into an attractive casing, and in locking means for the air pumping means."

The casing shown, threaded so as to take the burner, is provided with a transverse opening A, in which is adapted to move a piston B, with a transverse radial opening registering with the opening in the gas-supply pipe, and with the burner part when in the position that the gas may pass through the casing to the burner. The piston has a longitudinal opening (which does not extend entirely through the piston) at one end threaded to receive the threaded end of a stem C, which serves as a guide to hold the piston properly and cause the opening through the piston to register with the openings of the casing.



Fincke's Gas-Burner Controller.

To operate the piston for the purpose of shutting off the gas or causing it to be lighted, a device is arranged at the end of the pipe D. It comprises a cylinder or casing, the upper end of which is reduced to receive a threaded plug, and held in the casing is a piston E. It is normally forced in one direction by a spring; and attached to the piston is a rod, on the end of which is a handle or push button F, by which the piston may be moved in one direction against the action of the spring. The piston, when moved by the rod G, is adapted to force air through the tube D and force the piston B in the burner attachment in a position to permit gas to pass to the burner; but when the rod is released, the spring forces the piston in the opposite direction, so as to move the piston B to cut off the gas and thereby extinguish the light.

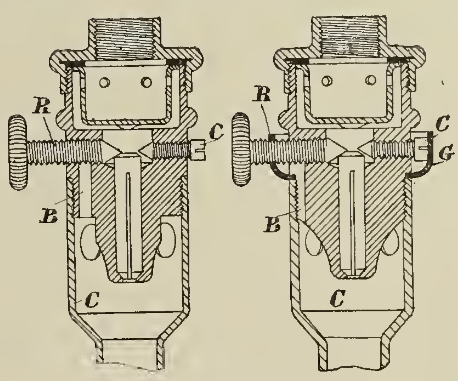
The rod G is normally held against the action of the spring by a lever H, within a recess inclined so as to provide a pivoting point for the lever. The lever is normally held at an angle with respect to the axis of the rod G by means of a spring. It, however, may be readily forced inward to move the piston, and is held in this position by reason of the inclination or cam action of the lever H, which will normally bind and hold the rod stationary. As the lever is raised, it releases the binding action of the lever, and the spring forces the piston downward in the cylinder, and the suction created thereby moves the piston B to shut off the gas.

Regulating Devices for Atmospheric Gas-Burners.

Deutsche Gasglühlicht Aktiengesellschaft, of Berlin.

No. 27,789; Dec. 21, 1908. Date claimed under International Convention, Jan. 28, 1908.

The illustration shows two forms of nipple embodying this invention.



Atmospheric Burner Nipples.

In the first, the nipple casing has a channel B, which connects the perforation for the adjusting screw or with the suction chamber C of the bunsen burner. By the injector effect of the burner nipple, negative pressure (suction effect) is always produced in the suction chamber of the burner. This suction effect is propagated in the channel B as far as the screw R, so that any gas accidentally leaking through the thread of the screw or the perforation is at once seized by the suction effect, carried through the channel B to the suction-chamber, and so prevented from passing out into the atmosphere.

The second arrangement differs only in that the channel B, instead of being provided within the nipple wall, is on the outside. It may take the form of an extension on the sides of the nipple wall, so that the nipple-tube forms the outer wall of the channel B. In this, the nipple-tube may be prolonged by a part integral therewith, or separately put on—say, a bell G, so as completely to cover the channel.

New Purifiers at the Bangor (Co. Down) Gas-Works.—On the recommendation of the Gas Manager (Mr. B. Mitchell), it has been decided to put in two purifiers, each 20 feet square and 5 feet deep, of concrete, with the exception of the lids and castings. This would, he said, be a reliable, safe, and cheap method of construction; and he estimated the total cost at a little less than £400.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Institution Gas-Heating Committee's Report.

SIR,—I would point out that Mr. Kendrick, in his letter in the "JOURNAL" for July 13, himself partly supplies an answer to his query, regarding the calorific power of the gas used in the Committee's experiments. The calculated calorific power based upon the constituents was his argument, not mine; and he stated it in no hesitating manner in your issue of June 29, although he now discovers that other values published, presumably reliable, may support that given by the Committee.

Does it not seem rather to be Mr. Kendrick who rushes into print impetuously, in view of the above and his admission as to temperature and pressure corrections? The latter are, of course, the Committee's standards, not mine. But it is instructive to note that they also seem to apply to German figures emanating from a similar scientific source. One can hardly condemn outright a course that has been followed advantageously where science has dealt with gases, although it is certainly regrettable that attention was not drawn in a more prominent way to the figures in the tables; for generally the text relating thereto is skipped or ignored.

If additional columns were added to the report embodying the suggestion made by Mr. Carpenter, it would leave but little room for misunderstanding.

Laboratory, Corporation Gas Department, A. EDWARDS.
Leeds, July 15, 1909.

Tar for Roads—South African Experience.

SIR,—It is interesting for engineers in the Colonies to read of the controversy and discussions at home on points of general practice, and compare the facts with their own experiences abroad. Particularly is this so in the matter of the application of tar to macadam road surfaces. In Colonial towns, there are many difficulties in road construction to be overcome from which the home engineer is free. The stone supply, for example, is limited to what can be found in the immediate vicinity; and the municipalities work their own quarries. The roads in South Africa are frequently 100 feet or more in width between the kerbs, having been laid out in this form in the early days for the accommodation of the unwieldy ox-waggon. The rate of rainfall is far heavier than is usual in England; and when a town is situated on the sides and at the foot of a steep range of hills, as is the case of Port Elizabeth, floods more or less severe are not unusual. Until recent years, it was not by any means uncommon for the damage to the roads from a single heavy rain, converting the roads for the time being into rivers, to amount to £1000 or more. Furrows in the roads running down the side of the hills were washed out 2 or 3 feet deep, and in some cases holes were formed large enough to bury a waggon and pair. All the stone and *débris* was washed down on the roads at the foot of the hill, stopping trams and general traffic.

Now all this is changed, at any rate so far as Port Elizabeth is concerned; and the change can be explained in one word—tar, cold crude tar, obtained direct from the gas-works, spread by hand, and worked in with rubber squeegees on a well-prepared surface, and dusted over with fine quarry grit. That is all. The flood water passes over it without causing any damage. Deep stone-paved channels to hold the large volume of water have been removed and replaced by shallow ones tar-macadamed, easily negotiable by vehicular traffic; roads which required repairs each year have in some cases already lasted five years without requiring further attention than a coat of tar alternate years; the noise of traffic has been reduced to a minimum; there is a large saving in scavenging and watering; the surface is not irritating to the eye in the summer sun, as is the blaze from the natural quartzite roads; and tradesmen find their expenses for repairs to carts reduced. In many towns the blinding dust is a curse, carrying with it small grains of stone which strike the face like a hailstorm. Here there is no dust, even in a strong gale. In fact, the change has been so great that Port Elizabeth has earned for herself the reputation of being "the cleanest town in South Africa."

The tarring practice has now been in use about five years, and the mileage of tarred roads is increasing yearly. Up to the present, 14 miles of the 64 miles of roadway in the Municipality have been tarred. These are the principal streets—in most cases of great width; and a further 6 or 7 miles will be added this year. During last summer (September to February), about 60,000 gallons of tar were used, at 6½d. per gallon at the works.

It was first thought that on the steep hills the tarred surface would be dangerously slippery. One of the principal thoroughfares has a gradient of 1 in 7·8 over a portion of its length. This has been tarred for three years without a single recorded accident. On one road with a gradient of 1 in 4·5, the central strip was left untarred. It is noticed that the descending traffic uses the tarred sides of the road. (A road of such an extreme gradient is naturally little used as an ascent.)

It is reported that other towns in the Colony are experimenting on similar lines; but there is a difficulty owing to the lack of tar, for many South African towns have installed electrical undertakings but have no gas supply. Besides the two gas-works of the South African Lighting Association, one at Port Elizabeth the other at Grahamstown, there are only two towns in South Africa—Cape Town and Johannesburg—which have gas.

Mr. A. S. Butterworth, Assoc.M.Inst.C.E., is the Town Engineer for Port Elizabeth; and it is under his *régime* that tar has played so important a part in the improvement of the town. In this respect he has led the way in South Africa; so that Port Elizabeth is now looked upon as a pattern town out here, so far as the condition of the roads and streets is concerned.

WILLIAM ARNOTT, Manager,
South African Lighting Association, Limited.
Port Elizabeth, June 28, 1909.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Prestatyn Urban District Council Bill.

Bill read a second time and committed: Local Government Provisional Orders (Gas) Bill.

Bills reported, with amendments: Derwent Valley Water Board Bill, Gas Provisional Order Bill, Gas and Water Orders Confirmation Bills, Pontypridd Water Bill, Swinton and Mexborough Gas Board Bill.

Bills read the third time and passed: Aldershot Gas and Water Bill, Ammanford Gas Bill, Risca Urban District Council Bill, West Gloucestershire Water Bill.

The Cardiff Corporation Bill has been referred to a Select Committee, consisting of the Duke of Northumberland (Chairman), the Earl of Carlisle, Lord Ellenborough, Lord Penrhyn, and Lord Crawshaw; to meet next Thursday.

The West Ham Gas Company have petitioned against alterations in the Gaslight and Coke Company Bill; and the Chadderton Urban District Council, against alterations in the Oldham Corporation Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bill read the first time and referred to the Examiners: Risca Urban District Council Bill.

Lords Bill read a second time and committed: Lisburn Urban District Council Bill.

Bill reported, with amendments: Heywood Corporation Bill.

Bills read the third time and passed: Frimley and Farnborough District Water Bill [Lords], Gas Orders Confirmation Bill (No. 1), Prestatyn Urban District Council Bill, South Staffordshire Water Bill [Lords].

LOW ILLUMINATING POWER FOR BURY.

The Bill promoted by the Bury Corporation to obtain authority (*inter alia*) to consolidate and amend the Acts relating to the gas undertaking was before the Local Legislation Committee last week. Clause 18 deals with the pressure and illuminating power of the gas. In regard to the former, the Corporation have hitherto been free from any statutory obligation; but in the Bill they propose that the pressure shall be 6-10ths from midnight to sunset and 8-10ths from sunset to midnight. This was sanctioned by the Committee. The second sub-section of the clause deals with illuminating power. It sets forth that "the prescribed number of candles shall not be less than 12, each consuming 120 grains of sperm per hour." A report on the Bill had been made, as customary, by the Local Government Board, and in it they suggested that the Committee should consider whether the illuminating power standard should not be increased. Mr. Jeeves, representing the Corporation, pointed out that they had not supplied gas of this low candle power—indeed, their gas was at present between 16 and 17 candles; but as there was a growing tendency to a lowering of the standard, they might at some future time deem it advisable to avail themselves of the provision. The Chairman remarked that there was no precedent for the promoters of a consolidation Bill such as the one under consideration, seeking to reduce the illuminating power of their gas to 12 candles; but as the Corporation already had authority to do this, the Committee would pass the sub-section as it stood. The next sub-section prescribed the "Metropolitan" No. 2 burner for testing the gas; and this was passed. By sub-section 4, the prescribed testing-place is to be "some part of the gas-works of the Corporation," or such other place as may be appointed by them; and the prescribed time is to be "one month after the commencement of the Act." This was allowed to stand.

GAS AND WATER ORDERS CONFIRMATION BILL.

House of Lords Committee—Tuesday, July 13.

(*Before the Duke of* DEVONSHIRE (*Chairman*), *the Duke of* WELLINGTON, *Lord* MANNERS, *Marquis of* ZETLAND, *and Marquis of* ANGLESEA.)

The above Committee had under consideration to-day the Gas and Water Orders Confirmation (Llynvi Valley Gas Order and Coatbridge Gas Order) Bill.

Llynvi Valley Gas Order—Reinstatement of Roads.

This was an Order promoted by the Llynvi Valley Gas Company.

Mr. VESEY KNOX appeared for the promoters; and the Glamorganshire County Council, who petitioned against the Bill, were represented by Mr. BLENNERHASSETT.

Mr. VESEY KNOX said the Llynvi Valley Gas Company was a small concern which was incorporated by Act of Parliament in 1868. The present capital was only £12,000. They went to the Board of Trade for further powers; and the only thing that the Order did was to increase the capital by £20,000. The Order included the Model Clause giving power to lay pipes in streets not dedicated to public use; and this was the only clause which in any way concerned streets or roads at all. They had never broken up a main road, because, although certain main roads came within their area of supply, there were overlapping powers held by other Gas Companies, who were responsible for the supply of gas in the areas wherein the main roads occurred.

Notwithstanding this, the Glamorgan County Council petitioned against the Bill, and asked for a special clause in relation to the breaking-up of all roads. The Company refused the clause; and the Board of Trade also refused to insert it. The County Council then wrote to the Company threatening them with the cost of an opposed Bill unless they agreed to the clause. The petitioners consulted the Parliamentary Agents for the Bill, who pointed out that the Order did not give any power for the breaking-up of streets. Now the County Council came for a fresh clause—not in limitation of the powers under the Order, but in limitation of the powers which they had had for 41 years. Counsel therefore submitted that the Council had no *locus standi*, because it was one of the settled principles of legislation that people were not entitled to be heard against past legislation unless they had some complaint of the particular proposal then before Parliament. None of the other road authorities in the district had complained of the Gas Company's conduct in the matter.

The Committee decided to hear the merits of the case.

The clause submitted by the County Council was as follows:

The reinstatement of roads within the County of Glamorgan broken up by the Company in the exercise of any of their statutory powers shall include the application of a sufficient layer of surface metalling of the same specification as that employed by the road authority for the particular road, and, where the road is ordinarily repaired by the use of a steam or other roller, shall include the use of such roller on the places where the road has been broken up until the surface thereof has been made uniform with the unbroken surface adjoining.

Mr. *Gibbons*, a Director of the Company, said they saw objection to the clause that the County Council suggested; but rather than fight the matter, they accepted it. The Company had not been to Parliament since 1868. He agreed with Counsel for the petitioners that there were powers required by County Councils now-a-days which were not needed at that time.

Mr. VESEY KNOX pointed out that the Board of Trade had informed the County Council that they could not see their way to require the insertion of the clause.

Mr. *Phillips*, the County Surveyor of Glamorgan, then gave evidence in support of the petitioners. He said that the Council had gone to great expense in the metalling of their roads; and when these were broken up by the gas companies, they made a trench and afterwards threw the material in again anyhow. It was of the utmost importance that the roads should be made up again uniformly.

Mr. BLENNERHASSETT, in addressing the Committee, said they made no complaint against the general law; but no provision was made as to such circumstances, and the powers they asked for were not given by the general law.

The Committee decided that the clause was not necessary.

Mr. VESEY KNOX then submitted that the Company had been vexatiously subjected to expense by the action of the County Council. The Council were this session promoting the Glamorgan Water Board Bill; and in that Bill they had not inserted the clause for which they were now asking.

The Committee decided in favour of the County Council on this point.

Coatbridge Gas Order—Calorific Power Test Discussed.

The Committee had this Order before them last Wednesday. Its object is to enable the Coatbridge Gas Company to reduce the illuminating power of their gas from 20-candle power to 15 candles, and to substitute the modern standard burner for testing purposes.

The Company were represented by Mr. HONORATUS LLOYD, K.C., and Mr. SHAW; and Mr. COWARD, K.C., and Mr. R. J. N. NEVILLE appeared for the Coatbridge Town Council, who petitioned.

Mr. HONORATUS LLOYD, in opening, said that in 1877 the Company was incorporated as a maximum-price Company; the maximum price being fixed at 6s. per 1000 cubic feet, and the maximum dividend at 10 per cent. upon the original capital of £12,650, and 7 per cent. upon new capital. The illuminating power was prescribed as 20 candles, and the union jet burner as the method of testing. In 1898, the Company were changed from the maximum price principle to the now generally accepted principle of the sliding-scale; and a standard price of 2s. 6d. per 1000 cubic feet was fixed. This was an extraordinarily low price. In fact, there was only one other instance in the United Kingdom of such a low standard price—namely, Plymouth. No doubt in fixing this price Parliament took into consideration the surrounding circumstances, including the advantageous position in which Coatbridge was situated for the purpose of manufacturing gas; and they fixed what they thought was a fair standard price, although it was almost unique. They also gave a neutral zone from 2s. 6d. to 2s. 11d. The result of this was that when the price went below 2s. 6d. the shareholders were entitled, if they earned it, to divide a greater dividend than the standard rate. The question would arise as to whether any change should be made in the standard price. The actual price at which gas had been sold had varied since 1898; the average being 2s. 4·34d., and at the present time was 2s. They had been selling at such a low price that they had not been able to earn the dividend they were entitled to divide; and during the last three years, in order to keep the price low, they had had to sacrifice some of the dividend to which they would have been entitled, could they have earned it. On the 10 per cent. capital the dividends had varied from £10 per cent. to £11 7s. 6d. per cent. on the sliding-scale, and on the 7 per cent. capital the dividend had varied from £7 per cent. to £7 19s. 3d. per cent. This was, in a sense, only on paper, because it was the dividend upon the nominal capital. The actual return, owing to the premiums paid for the stock, worked out at 4⅝ per cent. The time had come when the Company could not go on selling at this low price and drawing on their reserve, and they feared that, unless some economy could be made, they would have to raise the actual price. Among the methods by which the raising of the price could be avoided was the saving of cost by reducing the candle power and prescribing the model test. In earlier years, Parliament had prescribed a much higher candle power gas in Scotland than in England; but the Company were now asking to be put in line with every other gas company, because it had been the practice in the case of Scottish gas companies to reduce their candle power from 20 to 14 or 15. In England, too, it was the common practice. The Company were also asking for the modern argand No. 2 burner for testing purposes. In the petition, it was contended that if there was a reduction in the candle power and in the illuminating power there ought to be a reduction of the standard price. After the matter had been fully discussed before the Board of Trade, the neutral zone was taken away from the Company; and he would ask their Lordships not to interfere with the standard price. It was the margin in the standard price which had enabled them to weather the storm. For every penny reduction, the shareholders got between £600 and £700. It might be said that although Parliament had frequently granted a reduction of illuminating power, the reduction had been accompanied in all cases, where the reduction had exceeded 1-candle power, by a reduction in the standard price. But he thought there was no case where any company had been deprived of the neutral zone of 5d., as they had been, and at the same time had a reduction made in the standard price. A calorific standard was asked for by the petitioners. He would point out, however, that in the Gaslight and Coke Company's Bill of this year some such provision was being made for the first time in history; but it was by agreement. There was a point raised in the petition, too, with regard to sums from the reserve fund being placed to the profit and loss account; but the accounts had been published and audited, and he did not see how any question of illegality could now arise.

Mr. *James Johnston*, the Chairman of the Company, then gave evidence. He said the prices they charged for gas were the lowest in Scotland. In order to meet the dividends for the last few years, they had had to call upon their floating balance.

In answer to Mr. COWARD, witness said that if they had placed £2250 to reserve illegally, it was by an inadvertence, and they were willing to put the matter right. If they had paid a larger dividend in 1906, 1907, and 1908 than they were entitled to pay, and which they had not earned but had taken from reserve, they had no objection to remedy it. He did not agree that under the Bill the consumers would receive gas of about half its present illuminating power. He denied that they were really reducing the illuminating power by 7 candles, which, according to Mr. Corbet Woodall's evidence before the Board of Trade was equal to 2½d. They would give no concession to the Local Authority.

Replying to Mr. SHAW, witness said the Board of Trade had placed upon them a clause that they should, when required by a customer, put in a better class burner free of charge. As to the calorific test, it had not been put in any previous Act of Parliament, and it would be practically impossible to carry out such an obligation in the case of a small Company of this kind.

Mr. *Thomas Wilson*, the Manager of the works, said they could not accept the suggestion that 2s. 2d. should be the standard price. The testing-station asked to be placed in the Municipal Buildings was unnecessary, and the calorific standard was quite uncalled for.

Mr. NEVILLE: How do you explain that the Gaslight and Coke Company, who supply 14-candle gas, as against your proposed 15-candle power, are able to submit to this test without objection?

Witness: The gas in different classes of coal varies very considerably. Every particular quality of coal has a different calorific value.

Mr. SHAW: It has been agreed for certain reasons which are not before the Committee that the Gaslight and Coke Company are to apply this calorific test. Have you any experience of what the effect would be in Coatbridge?

Witness: It would be a considerable trouble and expense, and is quite unnecessary.

Mr. *Henry O'Connor*, of Edinburgh, said he had made tests of the Company's gas with flat-flame burner and the No. 2 argand. On the first day the tests with the flat-flame burner gave 14·2 candles, and by the No. 2 "Metropolitan" argand the result was 16·25 candles. On a later occasion, he again tested the gas; and the flat-flame burner showed 13·08 candles and the No. 2 argand 15·06 candles. Other tests made proved that the new burner would give a 15 or 20 per cent. better light than the ordinary flat-flame burner. Before any calorific test was applied, a number of working tests must be made. There were no working results by which they could judge the question; the only tests made being by experts and in laboratories with a few samples of coal. They gave no indication of what the result would be in the manufacture of gas in a works such as these.

Mr. *Corbet Woodall* said the standard price sliding-scale, having once been fixed, should never be altered. There was an error in the minds of some people that if there was a reduction of the standard price, it meant a reduction in the charge to the consumer. The only effect of a reduction of the standard price was to take away a certain portion of the profits which might be divided among the shareholders. The neutral zone had been a very valuable thing to the Company, because by its means they had been enabled to keep up their standard dividends. If the standard price were put down to 2s. 2d., as was suggested by the petitioners, it would mean the withdrawal of the Bill, because the Company could not possibly live. He agreed that there would be the difference which had been pointed out in the flat-flame and the No. 2 argand burners; but the flat-flame burner had no business to be used at all. It would be very harsh treatment to ask the Company, having done such good work, to reduce the price to be charged below 2s. 6d. With regard to calorific value, he could hardly imagine such a proposition being seriously put forward. This was a small Company, and they knew practically nothing of calorific value. They would want a long experience before they could really adopt it. The London County Council had been testing the gas of a number of London Companies for four years with regard to calorific value; but it was almost impossible to conceive such a suggestion as this being put forward.

Replying to Mr. COWARD, witness agreed that the calorific test was a most important matter, having regard to the alteration that had taken place in the substitution of heating and cooking for lighting.

This closed the case for the promoters.

Mr. *John Lavell*, of Coatbridge, then gave evidence in support of the petition of the Town Council. He contended that the reduction in candle power would be from 20 to 10 candles. Keeping in view the fact that the Company had been paying their maximum dividends, he thought 2s. 6d. per 1000 cubic feet was a high price to charge. In

suggesting a standard price of 2s. 2d., their object was not to reduce the dividend below the maximum. The question of calorific value was becoming more and more important to the consumer.

On the resumption of the proceedings on Thursday morning,

Mr. *Andrew M'Cosh*, a member of the Town Council, gave evidence in support of the petition. He said the Council were unanimously opposed to the Bill, because it was felt that the Company were promoting it merely to enable them to sell cheaper gas and pay enhanced dividends. The Company said the reduction in candle power was to be from 20 to 15 candles; but he held that the reduction would be 7 candles, which would mean a saving of 4½d. per 1000 cubic feet.

Replying to Mr. Honoratus Lloyd, witness agreed that 4½ per cent. was not an unfair rate of interest upon ordinary capital in an undertaking of this character. He did not agree that the neutral zone had been of any value, because to his knowledge it had never come into operation. Asked when they first considered this calorific test was of such great value, witness replied when they were having the 15-candle power gas. They did not realize the value of it when before the Board of Trade.

Mr. *Tatlock*, an analytical and consulting chemist, said he had made experiments with various burners on Glasgow gas and found a difference in the illuminating power. He had not tested the gas at the Coatbridge works with the argand No. 2 and the union jet burners. He agreed, in cross-examination, that the Glasgow gas gave a much higher illuminating power.

Mr. *E. H. Stevenson* said he had examined the Company's works, and had no fault at all to find with them. He thought the Company had done the very best they possibly could have done in the past. With regard to the inadvertences in the accounts, he said the amount the Company had improperly placed to the reserve fund ought to be taken out and carried forward, together with the interest which had accrued. With respect to the dividends, a reduction should be made in the next issue of dividend and balanced. It was not correct to say that during the past three years the Company had not paid their full dividends. In 1906, the profits were £7870. The amount required for dividend and interest was £5850; leaving a profit balance of £2000. In 1907, there was a profit balance of £525, but there might have been a loss actually. Last year there was actually a loss. The reduction in the candle power would really be to 9·5 candles. This was shown by tests made in different places. It was not a question of the coal, but the difference between the two burners. It was absolutely contrary to the practice of Parliament to come and ask for a reduction in the illuminating power to this extent without giving a reduction in the standard price, with the exception of where the reduction had only been 1 candle. When before the Board of Trade, Mr. Woodall mentioned that the saving would be to the extent of ⅝d. per candle; so that he contended the saving would be 4d. per 1000 cubic feet. He had no desire to put the Company in a worse position than they were now in, but the saving ought to go to the consumers. The proposition of the Company appeared to be that a proportion of the savings should go to the dividends. For three years the price charged had been 2s. 1d. per 1000 cubic feet, and for another period of three years the charge had been 2s. 2d. Under such circumstances, and having regard to the other circumstances of the Order, it would be without precedent for Parliament to pass it without a reduction of standard price. It was due to the reduction in the standard price that in previous years they had been enabled to pay largely increased dividends. The theory of the sliding-scale was not that in good times, and with good management, the Company should pay bigger dividends, and in bad times, or with bad management, the consumer should have to bear the burden. With regard to the calorific test, he said it was a simple matter. It was simple apparatus, and the expense involved in the test was practically nothing.

In cross-examination by Mr. Shaw, witness said this was not the first time that an attempt had been made to reduce the standard price below 2s. 6d. He agreed, however, that the attempt had not been successful. He did not think it necessary to have tested the gas at Coatbridge, because the difference between the two burners was the same everywhere, if the burners were properly used. Asked if there was a single case where Parliament had introduced the calorific standard in any Bill, witness instanced the Gaslight and Coke Company's Bill, where it was forced upon the Company in opposition.

Mr. Shaw: It is absolutely necessary, is it not, before you can introduce a test of this kind, to make practical tests with the coal to see what the calorific value is?

Witness: I do not think it is necessary.

But the different qualities of coal have different calorific values, have they not?—You deal with the gas; not with the coal. The calorific value of the gas is well known when one knows what the illuminating power of it is. Different gases do not vary in anything like the proportion of the solid material.

Is it not a fact that in the various qualities of coal the calorific value of the gas varies in almost every case?—Very slightly indeed.

In South Wales, the calorific value of the gas is different to the calorific value of the gas in Scotland?—Not of gas coal. Gases do not vary largely except in so far as they vary in illuminating power.

Mr. Coward, in addressing the Committee on behalf of the Council, said there were really only two points left—namely, the question of the standard price and the insertion of the calorific standard.

Mr. Shaw, replying on behalf of the Company, held that it was impossible to insert a calorific standard until there had been a great many practical tests actually made. Calorific value varied very much, and it would require three or four years' experience before they could put any figure in an Act of Parliament. There was not one tittle of evidence to enable the Committee to arrive at this figure. They had decided that the Council should have the testing-station in the Municipal Buildings; but it would be the Company's apparatus.

The Committee, having deliberated privately, decided to confirm the Order, and not to make any alteration in the standard price in consequence of the neutral zone having been taken away by the Board of Trade. The question of pressure they understood was agreed. With regard to clause 10, as to burners, they would make no change from the Model Clause, and they were unable to agree to the suggestion that a calorific test should be imposed.

LEGAL INTELLIGENCE.

CLAIM FOR DEMURRAGE ON A CARGO OF COAL.

In the Admiralty Divisional Court of the High Court of Justice towards the close of last year, Sir Gorell Barnes and Mr. Justice Bargrave Deane had before them an appeal from a judgment of His Honour Judge Thomas, in the Liverpool County Court, pronouncing the owners of the barque *August Leffler* (Messrs. Henricksen and Goldevin), of Christiania, liable in damages to Mr. Thomas Duxbury, of Manchester, for breach of contract.

In August of last year, Mr. Duxbury agreed to sell to the above-named firm a quantity of coal, f.o.b. Garston, for shipment to Christiania, cash against documents. They thereupon chartered the barque to carry the coal; the charter-party providing that the vessel was to be loaded in six working days, "as per usual colliery guarantee;" that for all claims of overage, as well as for payment of the freight, the Captain was to hold himself to the cargo and the receiver thereof and not to the shipper; but that the charterer was not to be responsible for any claim incurred at the port of loading, and demurrage, &c., was to be settled where due. During loading a dispute arose as to when the lay days began and ended; and, in the result, the Master of the vessel, who claimed 18 days' demurrage, refused to sign clean bills of lading. Under protest, however, he signed bills bearing words which, as held by the County Court Judge, gave him a lien for the alleged demurrage. On the vessel reaching Christiania, the owners refused to deliver the coal until demurrage at the rate of £10 10s. a day for 18 days was paid. This amount was deducted by the consignees in paying the seller the invoice price of the coal; whereupon Mr. Duxbury sued the owners to recover £210 as the damages he had sustained in consequence of the action of the Shipmaster. The Judge in the Court below held that the words "as per usual colliery guarantee" covered a breakdown at the colliery, which was the real cause of the delay in loading, and that consequently no demurrage was due. He therefore gave judgment for the amount claimed, with costs. The shipowners appealed, and contended that no such thing as a "colliery guarantee" was known at Garston. Their Lordships, however, dismissed the appeal, with costs.

The County Court Judge and their Lordships in the Admiralty Divisional Court having held that the claim was improperly indorsed on the bill of lading, the defendants took the matter to the Court of Appeal, where it lately occupied Lords Justices Vaughan Williams, Fletcher Moulton, and Buckley for two days. Mr. Horridge, K.C., and Mr. Keogh (instructed by Messrs. Collins, Robinson, and Co., of Liverpool) appeared for the appellants; Mr. Atkin, K.C., and Mr. Greer (instructed by Messrs. Farrer, Morgan, and Co., of Manchester) represented the respondents. It was contended on behalf of the appellants that the claim for demurrage was good—there being no "usual colliery guarantee" at Garston; further, that in any event the plaintiff could not succeed, as there were no contractual relations between him and the defendants; and, finally, that the payment made at Christiania was a voluntary one from which no damages followed. Lord Justice Vaughan Williams, in giving judgment, said he had come to the conclusion that there was no "usual colliery guarantee" at Garston, and that a right to demurrage arose at the port of loading. He therefore thought the appeal should be allowed. Lord Justice Fletcher Moulton agreed; expressing the opinion that, on the evidence, it was impossible to say there was any "usual colliery guarantee" existing at Garston. Lord Justice Buckley also agreed in allowing the appeal. He remarked that while he was not so confident as his learned brethren that the guarantee in question had not been established at Garston, he thought a letter which was before their Lordships in the Divisional Court made clear the date when the vessel came under demurrage. This being so, the plaintiff had no case. Judgment was accordingly entered for the appellants; a stay of execution, with the view to an appeal to the House of Lords, being refused.

Barrow-in-Furness Water-Works Dispute.

In the Court of Appeal last Wednesday, the case of *William Kennedy, Limited, v. Mayor and Corporation of Barrow-in-Furness*, came before Lords Justices Vaughan Williams, Fletcher Moulton, and Buckley, on the appeal of the plaintiffs against an order of Mr. Justice Bucknill in Chambers, staying the action under section 4 of the Arbitration Act, 1889. The plaintiffs, who are contractors of Glasgow, brought the action against the defendants to recover £31,264, the balance alleged to be due under a contract for the construction of a dam and intake in connection with certain water-works. The defendants' engineer stated that the dam was defective, and refused to give a certificate of completion; and eventually he employed other persons to do work upon the dam which, in his view, was necessary. Mr. Justice Bucknill made the order staying the action, on the ground that, under an arbitration clause in the contract, the dispute was one which ought to be referred to the defendants' Engineer, Colonel Strongitharm. Mr. Ratcliffe, who appeared in support of the appeal, argued that, in view of the attitude of Colonel Strongitharm in refusing to give the plaintiffs any specific information as to the alleged defects, the case was one which ought not to be referred to him, especially as, in a sense, he would be the principal witness. Mr. Jeeves, for the defendants, said the Colonel would no more be a witness than any other engineer who was named in the contract as arbitrator. Lord Justice Vaughan Williams, in giving judgment, said he had come to the conclusion that the appeal must be allowed. He based his decision entirely upon the ground that no arbitration clause whatever was contained in the contract. The clause which it was said appointed the Engineer arbitrator was, in his opinion, nothing more than a provision giving him administrative powers. Lords Justices Moulton and Buckley concurred; and the appeal was allowed, with costs. An application to stay the trial of the action pending a decision by the Corporation as to whether or not they would take the matter to the House of Lords was refused.

Plymouth Gas Company's Rating Appeal.

At the Plymouth Quarter Sessions yesterday week, Mr. J. A. Hawke and Mr. W. T. Lawrance applied, on behalf of the Plymouth and Stonehouse Gas Company, to have the Company's appeal against the assessment of their property by the Guardians of the Poor as the rating authority respited to the next sessions. The Recorder (Dr. Blake Odgers) said there were other rating appeals which could not be dealt with at the present sittings; and he proposed to adjourn the sessions. It was decided that the Gas Company's case should be put down for hearing at the adjourned sessions on the 6th of October.

"Edison" Gas-Mantles.

At the Nottingham Summons Court, last Wednesday, Albert Cox Bevans was summoned for unlawfully selling one dozen incandescent gas-mantles as "Edison" mantles, which, it was alleged, was a false trade description. Defendant was prosecuted by Mr. J. M. Barnett, on behalf of Mr. G. C. Marks, J.P., M.P., of London, who watches the interests of Mr. Edison's inventions in this country. Mr. A. C. Caporn, for the prosecution, stated that what was complained of was the use of the name "Edison." The name was perhaps as well known in England and all over the world as that of any other man at the present day; and it was absolutely necessary for Mr. Edison, in his own interests, to guard against the fraudulent use of his name in this manner. A gentleman spent the greater portion of his time stopping the improper use of the name. In this particular case, a representative of Mr. Marks went to defendant's shop, and asked if he could buy an Edison mantle. He was supplied with what he was told were Edison mantles, and was given an invoice stating, "One dozen Edison mantles, 2s. 6d." The mantles were in a box on the lid of which was printed in large letters "The Edison Gas-Mantle." Underneath, in very much smaller type, were the words: "This mantle is sold on the distinct understanding that it is not the invention of Thomas A. Edison, the American inventor, and that the proprietors of this mantle are not connected in any way with any person or company who deal in any articles connected with his name." In the shop window had been shown a lid on which the longer paragraph was not printed. Evidence of purchase having been given, and it having been stated that Mr. Edison did not make mantles, defendant pleaded "Not guilty." He stated that he had bought the mantles in the ordinary way of business from a traveller as "Edison" gas-mantles. He expected them to be Edison mantles. He had been selling the mantles since last October, and had disposed of thirteen dozen. The Chairman (Mr. G. Wigley), at the close of the case, said the Bench were of the opinion that the defendant was not the actual culprit, for he was not aware that he had done wrong; and the case against him would be dismissed. Mr. Caporn asked the Bench to state a case; but the Chairman declined, remarking that prosecutors had the name of the firm, if they wanted to take further proceedings.

Drunken Man Damages a Gas-Meter.—At the Old Street Police Court on Saturday, Walter George Goodman, a middle-aged man of respectable appearance, was charged before Mr. Cluer with damaging a meter, the property of the Gaslight and Coke Company. Mr. Humphreys, who prosecuted for the Company, said the accused returned home very drunk on Friday evening, and at once began to knock the gas-meter about with a heavy instrument, doing damage to the amount of 16s. Mr. Cluer severely censured the man for his conduct; pointing out that it might have resulted in setting fire to the building and inflicting irreparable injury on many unoffending human beings. The accused, who seemed to feel his position acutely, said he was quite at a loss to account for his conduct, except that he was maddened by drink. Mr. Cluer expressed surprise that the damage done to the meter could be rectified for so small an outlay as 16s. He said he could not possibly pass over so serious a case by merely making the prisoner pay for the damage he had done. He must, in addition, order him to pay a fine of £3.

Hoylake and West Kirby Gas and Water Company.

The report of the Directors and the accounts for the year ending June 30 (which will be submitted at the thirty-second ordinary general meeting on the 29th inst.) show that the balance at the credit of profit and loss, after payment of the dividends in respect of the year to June, 1908, was £1886, to which has to be added the net revenue for the past twelve months, £6841—making a total of £8727. Deducting the interim dividend paid in January (£2600), there is now available a sum of £6127. From this, the Board recommended the payment of the following dividends: 6 per cent. on the "A" gas original capital; 4½ per cent. on the "B" gas additional capital; 6 per cent. on the "A" water original capital; and 4½ per cent. on the "B" water additional capital. These will absorb £3899, and leave a balance of £2228. After transferring £100 to the water back-dividend reserve, and £100 to the gas contingency and plant renewal fund, there will be a sum of £2028 to carry forward. The dividend scheme now announced, together with the interim dividend paid in January, makes a total distribution, less income-tax, for the year of 10 and 7 per cent. on the "A" and "B" capitals respectively. The gas reserve fund still stands at £1565. The quantity of gas supplied last year to private consumers and the public lamps was 56,173,193 cubic feet. The price of gas during the period under review was 3s. 6d. per 1000 cubic feet, less varying discounts; while the charge to users of prepayment meters was 4s. 2d.

Reading Water Supply.—The annual report prepared by the Manager of the Reading Water-Works (Mr. Leslie Walker) states that the supply of water to the borough of Reading and adjacent districts for all purposes amounted in 1908 to 1,337,931,000 gallons, with an average daily consumption of 3,655,549 gallons. During the year, 5011 yards of new main were laid, of which 3733 yards were 12-inch. The maximum quantity of water supplied on any one day in the year was 4,877,000 gallons, on July 3; and the minimum was 2,904,000 gallons, on Nov. 30.

MISCELLANEOUS NEWS.

GAS SUPPLY BY PREPAYMENT METERS.

Experience in Edinburgh.

Mr. W. R. Herring, the Engineer to the Edinburgh and Leith Gas Commissioners, has prepared and submitted a report upon the supply of gas by the prepayment system, of which some extracts are given below.

Since 1897, the price of gas to ordinary and prepayment consumers and the price of gas to county consumers has ranged as follows:—

	City.	County.	Corstorphine.	Prepayment.	Number of Prepayment Meters.
1897 . .	3/-	3/3	4/-	4/2	—
1898 . .	3/-	3/3	4/-	4/2	337
1899 . .	3/-	3/3	4/-	4/2	905
1900 . .	3/-	3/3	4/-	4/2	1,458
1901 . .	3/- and 3/4	3/3 and 3/7	4/- and 4/4	4/2	2,314
1902 . .	3/4	3/4	4/4	4/2	3,581
1903 . .	3/4 and 3/-	3/4 and 3/-	4/4	4/2	5,219
1904 . .	3/- and 2/9	3/3	Same as County	4/2	6,520
1905 . .	2/9	3/3	,,	4/2	7,174
1906 . .	2/9	3/3	,,	4/2	8,425
1907 . .	2/9	3/3	,,	4/2	9,265
1908 . .	2/9 and 3/-	3/3 and 3/6	,,	4/2	10,167
1909 . .	3/-	3/6	,,	4/2	11,881

Up to the present we have not fitted prepayment meters outside the boundary of the City of Edinburgh or the Burgh of Leith.

In considering the question as to the price that should be charged to the consumer of gas who requires the special apparatus involved in the prepayment system, factors must be taken into account which do not affect the ordinary supply, not only in so far as their cost is concerned, but also the much more important question of the displacement of the existing apparatus and the loss of the capital it represents.

The average consumption per prepayment consumer in the following typical towns is as under:—

	Cubic Feet.
Glasgow	7,416
Dundee	8,165
Aberdeen	8,305
Edinburgh	5,500

Out of 94,578 ordinary consumers, we have 56,906 meters of a size equivalent to the ordinary prepayment meter in use.

From the very outset, the introduction of prepayment meters threatened the extinction of this large number of smaller meters; and though the Commissioners have consistently, in resolutions already quoted, tied up the supply by prepayment meter to houses not fitted with ordinary meters, we have in many cases been circumvented in this by the ingenuity of some who will give the formal notice for the removal of the ordinary meter and a few weeks afterwards require us to fix a prepayment supply. The only way we have been able to check this practice and keep it within normal bounds, is to delay as long as possible the fixing of the prepayment supply to persons who have had their ordinary supply cut off in order to get it. Notwithstanding this practice on our part, we have been obliged to fix as many as 3296 prepayment meters in houses already fitted with ordinary meters.

In arriving at the rate at which gas can be supplied by this particular means, regard must be had to the amount of consumption, as the additional expenditure may be said to be involved under the heading "Per Consumer;" and, whatever the additional expenditure may be, it must be divided over what is found to be the average consumption. I have therefore taken out the average consumption of the small consumer, of whom we have 56,906; and this is equal to 10,250 cubic feet per annum. There are, in addition, 11,881 prepayment meters, with an average consumption of 5500 cubic feet per annum. More than 68,000 consumers are therefore involved in this question.

It will be seen that the prepayment consumer burns only one-half the quantity of gas that his neighbour does. This alone involves greater expense per consumer, so far as ordinary administration is concerned. The meter reading and collection of moneys in actual practice costs four times as much, owing to the more frequent reading and collection of moneys from the boxes. The capital cost of the equipment is practically double that of the ordinary consumer; and, owing to the consumption being one-half in amount, the repair and maintenance is double that of an equivalent amount of capital spent on an ordinary consumer, as the wear and tear has its origin from external influences and not from within the pipe and meter itself.

I have gone carefully into all these charges, and find that the cost of meter-readers, clerks, and collectors, &c., is 3·76d. per 1000 feet of gas sold greater than is the case with the ordinary consumer's supply. The increased capital outlay involves a further expenditure of 1s. 8d., or 3·63d. per 1000 cubic feet sold. From our actual records, the extra cost to the Fittings Department in connection with the prepayment system, for attention to meters, which are more complicated and necessitate more frequent attention, adds a further 2s. per consumer, or 4·81d., making a grand total of 12·2d. per 1000 cubic feet in excess of what it costs to supply a consumer by the ordinary means. The greater number of consumers for a small consumption also increases other charges which cannot be so easily estimated.

The present charge for prepayment supply gas is 1s. 2d. per 1000 feet in excess of the ordinary rate, or 20 feet of gas for 1d. The average consumption of 5500 feet represents a cost of practically ¾d. per day for the lighting of a working-man's home, or an average of 15 cubic feet per day. This, burnt in an incandescent burner such as is used in the street lamps, would yield him 60 candles of illumination for an average lighting period of 7½ hours a day throughout the year.

There is a further very important question which must be taken into account in considering this subject, and that is the possibility of the present nearly 57,000 small meters being thrown on your hands by the present consumers should the price of gas by the prepayment system

be reduced. In my opinion, this would undoubtedly be the case, as we know from experience the popularity of the prepayment meter, and the desire of all small consumers to be supplied by this means. The result would he that any number, up to some 60,000 small meters, would be returned to our depôts, for which there would be practically no use. These meters represent a capital outlay of from £65,000 to £70,000, and would not be worth as many shillings if the smaller consumer is encouraged to use the prepayment system, as there would be no outlet whatever for the small meters that were displaced. On the other hand, meters to replace them would involve a further capital expenditure of £130,000 to £140,000.

It is therefore important that the class of consumers who prefer to buy their gas by the pennyworth should be made to pay the additional expense incurred in administering to their smaller wants; and it would he manifestly unfair to the 57,000 small ordinary consumers to do anything that would have a tendency to increase the cost of gas to them for the benefit of others who choose a more expensive way of acquiring it. For this reason, therefore, I am strongly of opinion that the 1s. 2d. in excess of the present rate is not more than is justified by the circumstances under which the gas is supplied, and that the charge is necessary in consequence of the very small consumption per individual consumer. If this were increased, the charges would be proportionately less; and it may therefore he worth the Commissioners considering some form of rebate whereby a person consuming a larger quantity of gas by this means should, in proportion to his consumption, approximate more nearly the rate at which the gas is supplied hy the ordinary meter. If, for instance, 5000 feet was used as a standard, which should be supplied at the rate of 20 feet for 1d. (the present rate), there should be a rebate of (say) 1d. for each succeeding 1000 feet or so. Thus:

6,000 feet per annum	should be granted	1d.,	rebate	equivalent	to	0s. 6d.
7,000	,,	2d.,	,,	,,		1s. 2d.
8,000	,,	3d.,	,,	,,		2s. 0d.
9,000	,,	4d.,	,,	,,		3s. 0d.
10,000	,,	5d.,	,,	,,		4s. 2d.
12,000	,,	6d.,	,,	,,		6s. 0d.
15,000	,,	7d.,	,,	,,		8s. 9d.

The rebates being made payable at a time of the year convenient to the adjustment of the accounts—probably the May term.

It must not be forgotten that a consumer is at liberty at all times to take a supply of gas hy the ordinary means, and pay the ordinary price. It should be further noted that all prepayment consumers are at liberty to have the use of a boiling-hurner and grill, fixed free; and the 11,000 consumers have taken advantage of this to the extent of 1012.

GAS SUPPLY OF PARIS.

First Report of the New Gas Company.

At a recent meeting of the shareholders of the Company formed to carry on, in association with the Municipality, the gas supply of Paris, the Directors presented their first report. The Company entered into possession on the 1st of September, 1907; and the period covered is the sixteen months up to Dec. 31 last. The following are the principal features of the report.

The quantity of gas consumed in the above-named period was 551,456,224 cubic metres, or about 19,466½ million cubic feet, of which 231,766,780 cubic metres, or 8181⅓ million cubic feet, were used in the daytime. The revenue from this source amounted to 102,267,086 frs. (£4,090,683), of which 75,660,511 frs. (£3,026,420) was for the twelve months ending Dec. 31. This was an increase of 4·54 per cent. on the revenue in the preceding year. The number of consumers on the books at the close of 1908 was: Ordinary, 331,275; on the free-fittings system, 276,874—total, 608,149. The figures at the corresponding period of the previous year were: Ordinary, 316,685; on the free-fittings system, 266,601—total, 583,286, or an increase of 24,863, or 4·26 per cent. There were 51,702 incandescent and 1258 ordinary burners (together 52,960) in use on Dec. 31; being an increase of 636 of the former and a decrease of 59 of the latter since Sept. 1, 1907. The number of rising pipes, for the supply of tenements, at the close of the period covered hy the report was 53,355; and they served 482,921 consumers, or 79·41 per cent. of the total. This was an increase of 33,259 since the Company took possession. In this period the network of mains was lengthened to the extent of 50,740 yards, bringing up the total to 1,964,970 yards, or ahout 1200 miles.

As already mentioned, the revenue from the sale of gas in the period covered by the report was 102,267,086 frs.; and beyond it residuals, meters, fittings, &c., produced 34,405,171 frs.—making together 136,672,257 frs. (£5,466,890). The expenses amounted to 104,176,580 frs. (£4,167,063); so that a sum of 32,495,677 frs. (£1,299,827) was available for the Municipality—being 9,924,610 frs. for the last four months of 1907, and 22,571,067 frs. for the year 1908. In addition to the expenditure on the manufacture and distribution of gas, the sum of 104,176,580 frs. mentioned above includes interest and sinking-fund charges, taxes, cost of new works, pensions and accidents, and the remuneration of the Company.

When the Company took possession on Sept. 1, 1907, they found that the works were inadequate to meet the growing demand for gas. The Directors therefore at once turned their attention to the subject of the necessary extensions, and early last year submitted to the Prefect of the Seine a series of proposals, of which the more urgent were approved of. The works indicated were at once undertaken; and, though hindered hy several obstacles (notably labour troubles), they were eventually carried out, and they enabled the Directors to satisfy the requirements of the consumers. A new retort-house, containing four henches of retorts with mechanical coal and coke handling plant, capable of producing rather more than 6 million cubic feet of gas per day, was erected at the Landy station; and two similar houses are in course of construction. By next year, therefore, the Company will have provided plant sufficient for the production of an additional 18½ million cubic feet of gas per day. Concurrently with these works, two new gasholders, each of about 5¼ million cubic feet capacity, were commenced; and the Directors propose to further increase the storage by telescoping several of the existing holders. A 40-inch trunk main, to connect the above-named station with the Place de la République, is approaching completion; and the laying of another to the Place de la Concorde has been started. These works, and others projected, will equip the several stations with plant which, by embodying the latest improvements, will not only effect a reduction in the net cost of gas, but improve the conditions of the people engaged in its manufacture. The capital outlay from Sept. 1, 1907, to Dec. 31, 1908, amounted to 10,711,492 frs. (£428,460), of which 4,287,733 frs. (£171,509) was for the Landy station. In addition to the first series of works, to be carried out between now and the end of next year, the Directors have submitted to the City authorities a scheme for a number of others to be spread over a series of years.

With regard to the financial position of the Company, the various sources of revenue are fully set out in the profit and loss account. The net profit for the period covered was 1,876,730 frs. (£75,069), which included 1,479,167 frs. (£59,166), the Company's remuneration for the management of the undertaking. After deducting 5 per cent. for the reserve fund, there was left a sum of 1,782,894 frs. (£71,316), which the Directors proposed to deal with as follows: Payment of a dividend of 12·50 frs. per share, 1,500,000 frs.; to be placed to the provident fund, 100,000 frs.; to he carried forward, 182,894 frs. The proposal was agreed to by the shareholders. The net profit accruing to the Municipality for the year 1908 was 22,571,067 frs. (£902,843). This sum being in excess of the 22,000,000 frs. stipulated in the agreement entered into with the Company, the latter became entitled to additional remuneration for the year to the extent of 150,000 frs.

In concluding their report, the Directors hear testimony to the zeal and devotion displayed by the employees in all departments of the Company, and they express their unfeigned satisfaction at discharging this duty.

LEYDEN MUNICIPAL GAS UNDERTAKING.

Report for the Year 1908.

We have received, through the courtesy of Heer N. W. van Doesburgh, the Manager of the Leyden municipal gas and electricity undertakings, a copy of the report on their working for the year 1908. The following is a summary of the report, in so far as it refers to the gas undertaking.

The agreement entered into in the previous year with the Dutch Railway Administration, in regard to the charges for railway communication to the gas-works, proved satisfactory. About 19,530 metric tons of coal were delivered hy rail; and the minimum charge of 2 florins per 10-ton waggon which had been fixed upon for large consignments amounted thereon to a sum which fell short by 616 florins (about £51) of the 4500 florins (£375) per annum which the gas undertaking had agreed to pay in any case for the railway accommodation. A contract was made in conjunction with the Municipal gas-works of The Hague for the supply of 20,400 tons of Westphalian gas coal, which was subsequently increased by a further 1000 tons. Some 210 tons of Java gas oil were bought from an Amsterdam company. The working of the undertaking showed a profit of 108,038 florins (about £9003), which is an increase on that for the preceding year.

The carbonizing plant consists of 19 beds of eight retorts, of which 16 beds were the maximum in use at any one time. A new purifying-house is being built by a Leyden firm, and four purifying vessels, with dry-seal lids, and a crane for raising the lids, are being supplied by a firm at Bergen-op-Zoom. Three four-way valves are being supplied by Messrs. C. & W. Walker, of Donnington. A second set of carburetted water-gas plant was supplied by Messrs. Humphreys and Glasgow, of a productive capacity of 16,000 cubic metres per diem (about 565,000 cubic feet). A second oil-tank is also being erected. The steam required for the carburetted water-gas plant and for other purposes on the gas-works is now taken from the electricity works. The boiler installation on the gas-works has therefore been discarded. A number of electro-motors have been installed for driving the exhausters, conveyors, and machinery generally; the power being taken from the electricity undertaking. A small extension has been made in the length of the distributing mains.

The total amount of gas made during the year was 9,742,182 cubic metres (344,055,000 cubic feet), of which 17·25 per cent. was carburetted water gas and the remainder coal gas. This is an increase of 0·583 per cent. on the make for the previous year (though a misprint in the figures given in last year's report indicates an apparent decrease). The make of gas per ton of coal carbonized was 10,653 cuhic feet, which is 517 cubic feet less than the previous year. In the manufacture of carburetted water gas, 21·8 lbs. of oil and 49·4 lbs. of coke were consumed per 1000 cuhic feet of gas made, inclusive of the coke consumed in the boilers. The gas consumed through ordinary meters shows a decrease of ahout 1·64 per cent.; while that consumed through prepayment meters shows an increase of 4·97 per cent. The unaccounted-for gas has fallen from 5·95 per cent. in the previous year to 5·39 per cent. this year. The consumption of gas by private consumers, per head of the population, has fallen from 4968 cuhic feet in 1907 to 4870 cubic feet in 1908. The high-pressure supply to the outlying villages of Sassenheim and Voorschoten proved successful, and accounted for 2·12 per cent. of the total gas consumed. The mean calorific power of the gas supplied was 4972 calories per cuhic metre (559 B.Th.U. per cubic foot). The sulphur in the purified gas averaged 34·4 grains per 100 cubic feet, with a maximum of 50·7 grains. The price of gas during the year was 5½ cents per cuhic metre, when registered through ordinary meters, and 6½ cents through prepayment meters (about 2s. 7d. and 3s. 1d. per 1000 cubic feet).

Owing to the large amount of work in their boiler-making department, Messrs. Peckett and Sons, of Bristol, are increasing the plant hy the addition of two electric travelling cranes, and they have also recently added to the plant of the same department a 200-ton hydraulic flanging press.

EUROPEAN GAS COMPANY, LIMITED.

Labour Questions on the Continent.

The Annual General Meeting of the Company was held last Tuesday at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. R. Hesketh Jones in the chair.

The Secretary (Mr. W. Williams) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read. The following is the report:

The sales of gas at the Company's stations show, in the aggregate, an increase of 3 per cent.; and with the exception of Caen, where the consumption for the present seems stationary, the improvement has been steady and continuous for some years past.

The cost of coals has been slightly in excess of that of the previous year; but the return from coke has been somewhat better. Tar and sulphate failed to realize such good prices as in 1906-7.

The Directors have secured a renewal of the contract with the Commune of Sotteville, adjoining Rouen, by which the Company's concession has been extended to 1940, in exchange for reductions in the price of gas.

The profits for the year enable the Directors to recommend the payment of the same dividend and bonus as last year—viz., a dividend of 20s. per share on the fully-paid shares, and 15s. per share on those £7 10s. paid, less the interim dividend of 10s. and 7s. 6d. per share respectively paid on Feb. 1 last; also a bonus of 2 per cent. on all shares, according to the amount paid thereon, subject, however, to a deduction for French stamp and transfer duty of 1s. 1d. per fully-paid share, and 10d. per share £7 10s. paid, in respect of all shares held in France.

It is with much regret that the Directors have to report the resignation of Mr. E. F. White, owing to considerations of health. The shareholders have been informed that Mr. R. S. Gardiner has been nominated by the Board to fill the vacancy, subject to confirmation at this meeting.

Notice has been given that two Directors (Messrs. H. C. Smith and R. Hesketh Jones), and both Auditors (Messrs. J. Reeson and A. T. Eastman), retire from office at this meeting; but, all being eligible, they offer themselves for re-election.

The Chairman, in moving the adoption of the report and the accounts, said the shareholders only met once a year; and when they did so, it was always gratifying to the Chairman to be able to present a satisfactory report and statement of accounts for the then past year, such as were the present ones. Another object of the meeting was to consider the prospects for the future. As to the latter, he had no hesitation in saying that they did not give the Directors any anxiety, as there was every reason to expect continuous prosperity to the Company, as in the past. In the first paragraph of the report, the Directors stated that, in the aggregate, there was an increase of 3 per cent. in the consumption of gas; and this notwithstanding competition with electric light companies at all the stations, and the continuous use of improved modes of gas lighting, which reduced the consumption. The increased use of gas compared favourably with similar undertakings. Caen was alluded to as somewhat stationary. The decrease in the rental was only 1 per cent.; but the profits slightly exceeded those of 1908. Caen was not a progressive place; geographically it was at a disadvantage to some of its sister stations. During the past year the Directors had disposed of the shop in the town, and had secured more commodious premises for the show-rooms, at some slight additional cost; and they looked forward to good results from taking this step. Any extension of a concession added to the stability of the Company. Sotteville was practically a suburb of Rouen, although an independent commune. During the thirty years of the new concession, it would no doubt increase in popularity as a residential district. It showed at the present time signs in that direction. The acceptance by Mr. Gardiner of a seat on the Board, would give him (the Chairman) the opportunity of moving the confirmation of his nomination. Mr. Gardiner's great experience in the affairs of Continental business, and his long associations with the Imperial Continental Gas Association, the Union des Gaz, and the Danish Gas Company, as well as his position as a member of the Council of the Société Technique du Gaz en France, eminently qualified him to occupy a seat at the Board of the Company; and he (the Chairman) was sure that the shareholders would be unanimous in confirming his election. A few weeks ago, and since the period under review, the Directors had had a little trouble with the men at Nantes. They demanded conditions which would have empowered them to regulate their own duties, to select their own comrades, and prevent the dismissal of incompetent or surplus workmen—thus practically superseding the control and directions of their employers. These demands the Company declined to entertain, and were subsequently withdrawn, upon which the Company agreed to submit the question of rates of wages to the arbitration of the Juge de Paix, who had since given an award, which would be binding on both sides for a period of five years. He had been asked: "Why do not the European Gas Company adopt the profit-sharing scheme?" The answer was simply because the differences between a Company such as the European, and an English Company, such as the South Metropolitan, were so great that it could not be done. The English Company's operations, though embracing a large area of several parishes, were limited to one defined area, in which they had a parliamentary monopoly and privileges. The European Gas Company supplied gas in several towns, some of them 300 miles apart from each other, and carried on their business under concessions from several Municipal and Communal authorities for varying periods, and at defined selling prices. They had to set aside out of the profits varying sums for amortization, proportionate to the unexpired terms for the time being of the several concessions; the cost and quality of coal varied in the different towns; the share capital embraced the Company's entire assets, and could not be subdivided between the several towns which they supplied with gas. Co-partnership in an English Gas Company with the dividends dependent on the selling price of gas, could not be applied to a French Company, trading in several towns under varied conditions of tenure from various local authorities. But the Company did what they could. They paid their men the highest (and oftentimes more than the highest) rate of wages in the town for similar work. They granted the men and their widows pensions free from any contributions from the employees. They supplied them with gas at less than cost price, and with coke at considerably reduced prices. They allowed half-pay to the married men during temporary absence for military training, and about quarter-pay to the single men. Liberal subscriptions were made to the sick and relief funds, and assistance was given the wives and children in other ways. In cases of accident to the men, the Company made grants outside their legal rights; and in many little ways privileges were conceded which, in the aggregate, did not compare unfavourably with co-partnership. During the financial year under review, the sums so granted represented $5\frac{1}{4}$ per cent. on the dividends paid to the shareholders, and an addition of $4\frac{1}{2}$ per cent. to salaries and wages. In conclusion, he moved the adoption of the report and accounts.

Mr. N. E. B. Garey seconded the motion; and it was unanimously passed.

Proposed by the Chairman, and seconded by Mr. Garey, a resolution regarding the dividend was passed in accordance with the terms of the recommendation in the report.

On being formally proposed by the Chairman, the election of Mr. R. S. Gardiner to a seat at the Board was very cordially endorsed by the shareholders.

Mr. Gardiner, in his acknowledgment, observed that for what they were worth, his services would always be most gladly given to maintain the prosperity of this remarkably sound undertaking.

Proposed by Mr. H. E. Jones, and seconded by Mr. Garey, the Chairman and Mr. H. C. Smith, who were the Directors retiring, were unanimously re-elected; and subsequently the Auditors (Messrs. J. Reeson and A. T. Eastman) were re-appointed, on the motion of Mr. H. D. Ellis, seconded by Mr. Beausire.

Mr. Gardiner said he had much pleasure in moving a hearty vote of thanks to the General Manager and Secretary (Mr. Williams), to the staff in London, and to the Managers and staff abroad. Soon after his (Mr. Gardiner's) election to a seat on the Board, he, at the Chairman's suggestion, visited all the Company's stations; and after the experience acquired during this visit he could not speak too highly of the capacity and merits of the respective Managers. He happened to have had some little experience in visiting similar works; and he unhesitatingly said—and he meant it—that the Managers the Company were so fortunate as to possess were exceptionally qualified to represent the interests of the undertaking, and to further them to a very high degree. He did think it was largely owing to their capacity, to their merits, to their work—their very good work—that the Company were so prosperous. Of course, it was almost superfluous to say how much the Company owed to the General Manager. At all events, it was well known in the gas industry; and the Directors were fully aware that a vote of thanks had been earned, and well earned.

Mr. H. E. Jones seconded the motion; and it was heartily agreed to.

Mr. Williams, in responding, remarked that, personally and on behalf of all concerned, he thanked the Directors and shareholders for the vote they had been good enough to pass. Praise from such gentlemen as Mr. Gardiner and Mr. Jones and from the other members of the Board carried with it great weight, owing to the knowledge that these gentlemen had of the gas industry. The vote would be greatly appreciated both abroad and in London; and it would be a stimulus to everybody to do his best to further the interests of the Company.

Mr. A. T. Eastman, in moving a vote of thanks to the Chairman and Directors, said he should like to say the shareholders all regretted to see the last of Mr. Felix White, who was the bearer of a name in the gas industry which had been honoured and held high place over the past half century. At the same time, he felt the shareholders might congratulate themselves on the accession of Mr. Gardiner to the Board. They recognized that the Board was strengthened by his election.

Mr. Richard Stevens seconded the motion, which was unanimously carried.

An acknowledgment by the Chairman concluded the proceedings.

WIGAN CORPORATION GAS UNDERTAKING.

Annual Report and Accounts.

The Gas Engineer and Manager of the Wigan Corporation (Mr. Joseph Timmins, M.Inst.C.E.) has presented to the Gas Committee his report on the working of the gas undertaking in the year ended the 31st of March. The following are its principal features.

Mr. Timmins says the works were maintained in a high state of efficiency during the year; but there was little done in the way of extensions *per se*. Rapid strides continue to be made in extending the mains, services, and meters. The carburetted water-gas plant was completed and brought into action during the year, and the official inauguration took place on the 22nd of December, in the presence of the Chairman and Vice-Chairman of the Committee and other members of the Council, as reported in the "Journal" for the 5th of January. After careful inspection, a favourable opinion was expressed of the quality of the work, and the manner in which it had been carried out and brought to a successful issue. It is recorded that the Contractors' guarantee has been more than fulfilled under every head—more especially in respect of the generating capabilities of the plant. The guarantee was for 600,000 cubic feet per diem; but in actual working it has proved capable of generating 750,000 cubic feet.

The total length of gas-mains laid up to March 31 was 128 miles 350 yards. At the beginning of the year there were on the books 13,058 consumers by ordinary meters, and 7484 by slot meters; at the end there were 13,304 ordinary and 8147 slot consumers—or an increase of 246 by the former, or 1·87 per cent., and 663 by the latter, or 8·86 per cent. The total increase of consumers for the year was 909, or 4·42 per cent. The number of gas-cookers fixed at the beginning of the year was 1845, and at the end of the year 1933—an increase of 88, or 4·71 per cent. The number of gas-engines on the register on March 31 was 108; representing in the aggregate 505 nominal horse power.

Appended to the report is a comparative analysis of the working results and costs, covering the two years ending on March 31, 1908 and 1909, of which the following is a brief *résumé:* There was a decrease in the past year of 2786 tons 14 cwt., or 6·54 cent., in the quantity of coal carbonized; 43,551 gallons of gas oil were used; 16,018,000 cubic feet

of carburetted water gas were produced; and there was a decrease in the total make of gas of 3,250,000 cubic feet, or 0·64 per cent. There was also a decrease of 1,541,200 cubic feet, or 0·33 per cent. (452,436,600 cubic feet compared with 453,977,800 cubic feet), in the total quantity of gas sold, including the gas supplied for the public lamps within the borough and that used on the works. But the consumption through slot-meters, included in the above figures, was 8,142,200 cubic feet, or 13·24 per cent., more than in the year 1907-8. In connection with this class of consumption, Mr. Timmins says it is pleasing to note that a good increase is maintained. In evidence of this, in addition to that given above, it is mentioned that during the year 2,187,043 pennies were collected from the respective coin-box attachments, against 2,048,970 pennies in the preceding year; representing respectively the sums of £9112 13s. 7d. and £8536 19s. 2d., or 43,741 lbs. and 40,979 lbs. Consumers having these meters still continue to utilize the coin-box attachments for depositing any surplus cash of which they may be possessed, notwithstanding that warnings have been given of confiscation. The gold, silver, small copper, and spurious coins, &c., found were as follows: 12 sovereigns, 18 half-sovereigns, 40 half-crowns, 641 florins, 970 shillings, 91 sixpences, 427 threepenny pieces, and 813 foreign coins, tallies, and washers. All spurious coins, tallies, and washers were destroyed, and, as on previous occasions, a warning was given that legal proceedings would be taken against consumers in whose meters they were discovered. Twenty coin-boxes were broken into during the year. The loss, however, was only £1 13s. 3d., the bulk of which may possibly be recovered.

The consumption of gas for cooking, heating, and motive power last year was 71,378,800 cubic feet, compared with 69,128,400 cubic feet in 1907-8. There was a decrease to the extent of 1·36 per cent. in the quantity of gas used for cooking and heating, but an increase of 13·31 per cent. in that employed for motive power.

Mr. Timmins concludes his report by thanking the Chairman, Vice-Chairman, and other members of the Committee for the support and encouragement he has received from them; and by expressing his pleasure in again being able to bear testimony to the loyal co-operation of those of the staff who are associated with him in the manipulation of the various operations of the gas undertaking.

The accounts accompanying the report show that the total revenue amounted to £82,355, and the expenditure to £54,367; leaving a balance of £27,988 to go to the profit and loss account. Adding the amount brought forward (£4547), there was produced a sum of £32,535, which is accounted for as follows: Interest, sinking fund, bad debts, &c., £17,831; public lighting, £5402; transferred to the general district fund, £3000; balance carried forward, £6302—being the amount of profit for the year (£11,704), less the value of the gas given to the Streets Committee for the public lighting within the borough. The average annual profit for the past 24 years has been £23,500 gross, or 6·07 per cent. on the capital invested, and £9463 net, including the value of the gas supplied free for public lighting.

THE REDUCED PROFITS AT CARLISLE.

At the Meeting of the Carlisle Town Council last Tuesday, a lengthy statement was made with reference to the operations of the gas undertaking for the financial year to March 31 last.

Mr. Buck, in dealing with the matter, said without doubt the results had produced considerable disappointment, and probably, in the minds of some, slight irritation. He hoped, however, after considering the position, they would be able to bear the disappointment with equanimity, and that the irritation might entirely disappear. The reduction of the net profits of the previous year of £3634 to £464 last year would, no doubt, require considerable explanation. Last year coal cost £220 and oil £198 more than the previous year. Having bought in June, 1908, coal at a less price than the previous year, and having produced less gas, they would understand that special circumstances had arisen to produce this effect. In the first place, they were using in the first three months of the year coal at the higher price, so that they had only had the reduction for nine months; and as oil was considerably dearer, it was found better to use less oil, which was always employed as an enricher, and to use more coal, at the same time taking less gas from the coal in order to keep the illuminating power at the highest efficiency. In this way they used 750 tons more coal; and it was calculated that they saved about £80 under these exceptional circumstances. Gas oil cost them nearly ½d. per gallon more than the previous year; thus making the carburetted water gas fully 1d. per 1000 cubic feet higher. The price the Committee were paying for the current year was rather more than ½d. less than last year, and should effect a saving of £500 or £600. Another big increase was for purification; the total advance on this head alone being £333. Lime had cost £114 more; oxide, £32; and wages, £79. For years past they had been troubled with back-pressure on the purifying plant, and means had been taken to reduce this. It had always been a considerable danger; and the Council would be pleased to learn that it had been reduced to a minimum, if not altogether abated. It was obvious to him that this department would be more costly; but the advantage of the danger being removed fully compensated for the outlay. He might say that they did not anticipate it would be as costly in the future as it had been in the past, as the extra price paid for lime, which was used purely in an experimental sense, would not occur again; and under the new system they would be able to purify a greater quantity of gas, should the occasion arise. Wages had been a serious item; and here they had had to face a difficulty with the calendar. The Auditors, in their report for 1907-8, stated that "in the gas, water, and baths accounts no provision has been made for the liability for wages accrued from March 25 to 31." Thus last year they had been debited with 53 weekly payments, or a sum equal to about £400, of which £200 ought to have been charged to the previous year. Coming to repair and maintenance, he said a very serious increase faced them in this department of gas manufacture—viz., £988. This had been entirely owing to the relining of a gasholder tank and part of the cost of laying an 18-inch main to Boustead's Grassing. These cost £1400. If the Finance Committee continued to demand their uttermost farthing, and if they did not place a sum yearly in reserve for these contingencies, then from time to time such variations in expenditure would occur; and he ventured to think that in the near future they would have strong evidence of this. Their total expenditure last year had been £37,833, against £35,902 in the previous year, or £1930 more. Turning to the income side of the balance-sheet, he said that while they unfortunately had to record increases in various items of expenditure, they were again in the regrettable position of having decreases in several items of revenue. It was a fairly accepted fact that the demand for gas did not increase, owing undoubtedly to the production of electric light, and to some extent to the use of the incandescent burner; and he was afraid that during the past year empty houses had had something to do with it as well. High-water mark with regard to the production of gas in Carlisle was reached in 1904, when 314,337,500 cubic feet were registered. In 1908-9 they sold 288,653,100 cubic feet, which showed a reduction of 25,684,100 feet. Last year they made 3,381,000 cubic feet less than the previous year; but, owing to economy in use in the works and to a less amount being unaccounted for, they sold only 1,521,900 cubic feet less. Consequently their income from private rentals was £31,126, against £31,678—a reduction of £452; and from public lighting £3526, against £3561—a reduction of £35. As to residuals, he regretted to say that they had received £703 less on this head than the previous year. Coke saleable and available for the manufacture of carburetted water gas was greater last year than in 1907-8; reaching the high figure of 11·02 cwt. per ton of coal carbonized. In spite of this, they received £32 less; but they were, and had always been, in an unfortunate position with this material, having at times large stocks on hand and very little storage room, while the cost of labour in stacking, &c., was very high. They had often to reduce their price to effect sales, on account of their storage being so limited. Tar had also been very disappointing. A huge drop in the market value had to be recorded from the previous year; and this was likely to continue, unless there was a great demand for this residual for road-making, which they were inclined to think there soon would be. On this material alone, they had received £500 less than the previous year. With regard to sulphate of ammonia the amount received was £165 less. Very little variation occurred in the other items of income. Comparing the position to-day with twenty years ago, he said that from 1889 to 1902, a period of fourteen years, there was paid into the city fund for the relief of the rates £40,561, and a sum of £3550 was paid into the reserve—a total of £44,111. During that time £9294 was received for meter-rentals. From 1903 to 1909, a period of seven years inclusive, the total amount available for the relief of the rates was £38,424; but during this period there were no meter-rentals, and £6000 had been paid off the carburetted water-gas plant and £1616 for the conversion of public lamps. They had also borne their proportion of the Town Clerk's and City Treasurer's salaries; and a reduction had been granted to prepayment meter consumers. He was convinced that in this undertaking the Council had a very valuable asset; and with careful supervision it ought to be a remunerative business. He was sanguine that next year the Committee would have a much more palatable account to lay before the Council.

WARRINGTON CORPORATION GAS UNDERTAKING.

In the course of a report with reference to his department, Mr. W. S. Haddock, the Gas Engineer to the Warrington Corporation, says that the buildings and manufacturing plant have been kept in a good state of repair. The reduced output of gas is very disappointing, especially after the reduction in price; but, so far as is known, it is almost entirely due to the bad condition of trade. The demand for gas having been less, there is a loss in the revenue from gas, coke, and tar of over £2500. Sulphate of ammonia shows an increased revenue of over £220; but this is due to all the liquor being used for sulphate. The revenue from liquor is £124 less than last year. The above losses are nearly covered by the reduced coal bill, which is about £2400 less. The increased expenditure on brickwork, ironwork, mains, and ovens is due to postponing the repairs as much as possible the year before last, to meet the high price of coal. Tar products continue very low in price, but have had an upward tendency for some few weeks. The coal market is weak; and a concession of 6d. to 1s. per ton has been made to those gas-works who have renewed their contracts. As the profit was so satisfactory last year, and the prospects are favourable, it will be advisable to make a further reduction in the price of gas to all consumers. The decreased make of gas is 14,561,400 cubic feet, or 3·1 per cent. under last year's production.

PROPOSED LOAN AT SEDGLEY.

At the Meeting of the Sedgley Urban District Council last Tuesday, the Gas-Works Management Committee presented a report on the subject of the supply of free cooking stoves and the securing of additional capital, and recommended the Council to authorize application to be made to the Local Government Board for their sanction to the borrowing of £2000 for the purpose of developing the earning capacity of the undertaking by extending facilities for the more general use of gas.

The report dealt with the commercial aspect of the suggestion to supply and fix free cookers to consumers using prepayment meters, and stated this was no new or experimental proposal, but had been for years in vogue in many districts, and had been applied to most progressive gas undertakings. The Committee already furnished, at no charge for rent or fixing, a supply of gas by prepayment meter with two-light fittings, and, if desired, a heating ring. There were now 362 such consumers; and during 1908 the average consumption by slot meter was 6400 cubic feet, which showed a return, at 20 cubic feet for 1d., of £482 10s. This return was equivalent to 40 per cent. on the outlay, when it was remembered that the works costs would have been substantially the same if these 362 installations had not been made

he average cost to the department of installing a supply of gas by pre-
ayment meter was £3 7s. 6d. Therefore the 362 installations had in-
olved an outlay of £1222, the whole of which had been defrayed out
revenue account. The policy of providing capital expenditure out of
venue was an ideal one, so long as there was sufficient available to
eet all demands for extensions to new consumers. But at the present
me there were about forty applications for supplies of gas which,
rough shortage of funds, were standing in abeyance. These were
oluntary applications; and there was no doubt that if an effort was
ade by means of canvassing and soliciting new consumers, this
umber could readily be greatly increased. The capital expended on
e undertaking was £17,000; and the turnover of revenue, accord-
g to the last audited return for the year ended March 31, 1908,
as £5520, or nearly 33 per cent. with a profit of £1600, or over
per cent. There was something to be said against the policy
utilizing all the available revenue for capital purposes, without
ny provision of a sinking fund or a renewals fund. The Manager,
his last annual report, foreshadowed the necessity of an expendi-
re in the near future of £3500; and a good portion was for
ork of the nature of reconstruction, in respect of which no bor-
owing powers could be obtained—the cost falling of necessity upon
venue account, which, unless the output was to be restricted, would
e unable to meet the expenditure. It was, therefore, urged that the
ouncil should sanction the policy of establishing a reserve fund, so
at the Committee might be in a position for dealing promptly with
ny emergency that might arise. The policy which had been suc-
essfully followed by other gas undertakings was to afford every
cility for the use of gas; and Brierley Hill had, since the end of last
ear, supplied about 600 free stoves to this number of their prepay-
ent consumers.

An important feature in introducing the more general use of cooking-
oves was that it increased the day-load, and more evenly balanced
e consumption by bringing the summer load more into line with that
the winter. The greater the output of gas, the less in ratio the
orks costs, and consequently the better the prospect of supplying at a
heaper rate. The capital required to provide and fix 250 stoves would
e about £500, and the repayment of this amount over ten years, which
as the period usually allowed by the Local Government Board for this
urpose, would amount to about £60. Estimating the average increased
onsumption at 4000 cubic feet on 250 stoves, which the Chairman of
e Committee was advised was a very moderate estimate, the income
ould be over £200 per annum. The Committee were arranging a
emonstration in the district with a view to stimulating the demand
or gas; and it was anticipated, having regard to the reduction of 3d.
er 1000 feet which had recently come into force, that many new con-
umers would make application. The Committee asked the Council to
ake application to the Local Government Board for sanction to the
orrowing of £2000, of which £500 would be raised forthwith, and the
alance at such time or times as the Committee, with the consent of the
Council, should deem expedient.

After some discussion, the Clerk suggested that the report should be
dopted on the understanding that a loan should not be negotiated
nless the Council were satisfied that the number of consumers of gas
warranted this step; and this was agreed to by 10 votes to 5.

GAS AND ELECTRICITY AT TODMORDEN.

In his report to the Todmorden Corporation Gas and Electricity Committee, on the working for the year to March 31, Mr. Henry Talbot, the Engineer and Manager, states that the total quantity of gas made was 151,223,000 cubic feet, of which 12,134,000 feet was carburetted water gas; the figures for the previous year having been 148,489,000 and 7,662,000 feet respectively. The quantity sold was 137,661,540 cubic feet, against 136,806,070 feet; the unaccounted-for gas being 8·02 per cent. on the total quantity made, compared with 6·73 per cent. In explanation of this increase, Mr. Talbot points out that there have been a number of serious leakages during the year owing to broken mains, due obviously to the heavy motor traffic which passes along the roads. For the manufacture of gas in the past year, there were used 11,021 tons of coal, 1388 tons of cannel, and the oil equivalent of 1082 tons of coal.

The make of gas per ton of coal carbonized had been 11,207 cubic feet, against 11,132 cubic feet the previous year, or an increase of 79 cubic feet per ton. Of the gas sold, 27·14 per cent. was for mills, 5·62 per cent. for engines, 48 per cent. for private lighting through ordinary meters, 11·43 per cent. through prepayment meters, and 7·81 per cent. for public lamps. There are in use 4249 ordinary meters and 1645 prepayment meters for private lighting, 525 cooking-stoves on rental, 2934 grillers, and 72 engines. The meters show an increase of 162, grillers of 240, and engines of 2. During the year 65 stoves and 36 boilers have been fixed on the hire-purchase system. Last year there were 61 stoves and 25 boilers. The prices of gas throughout the year have been: For lighting, both public and private, 2s. 8d. per 1000 cubic feet, less 12½ per cent. discount; for engines, 2s., less 12½ per cent.; and for prepayment meter users, 30 cubic feet for 1d. The Council, however, at their last monthly meeting, decided to reduce the price to ordinary consumers to 2s. 6d. per 1000 cubic feet, less 12½ per cent. discount—a reduction of 2d.—as from the 1st inst.

The receipts for the past year were £23,499, and the expenditure £15,705—thus leaving a gross profit of £7794. Interest and sinking fund charges, &c., absorbed £6313; and the net profit for the year carried to the appropriation account was £1481, in addition to an amount of £177 dividends on investment of the reserve fund. There is charged to the appropriation account (the total of which, with the sum brought forward, was £7695) £401 of capital outlay during the year for which it is not intended to raise loans, and £461 transferred to the district fund in aid of the rates.

As to the electricity works, the number of units sold was 106,918, as compared with 89,097 in the preceding year. The consumers now number 120 for lighting and 38 for power; the additions during the year having been 17 for lighting and 7 for power.

CLITHEROE GAS DEPARTMENT.

Report of the Engineer and Manager.

The report of the Gas Engineer and Manager of the Clitheroe Corporation (Mr. Robert Barrett) for the year ended the 25th of March shows that the revenue was £11,482, and the expenditure £7430; leaving a gross profit of £4052. Deducting the annuities, interest on loans, and the addition to the sinking fund, there was left a net profit of £2020—an increase of £439 on that for the year 1907-8. Of this sum, £824 was placed to the depreciation account; leaving £1196 as the profit on the year's working. The receipts for gas sold amounted to £8408, compared with £8127 before, or an increase of £281. The revenue from residuals was £2344, against £2173, or an increase of £171. Coke showed an increase of £290; but tar and ammoniacal liquor a decrease of £118. During the year, 5957 tons of coal and cannel were carbonized, compared with 6096 tons in 1907-8—a decrease of 139 tons. The total quantity of gas manufactured was 63,538,600 cubic feet; being an increase of 1,675,800 cubic feet. The gas made per ton of coal was 10,666 cubic feet, against 10,148 cubic feet before—an increase of 518 cubic feet. The total quantity of gas sold was 60,531,999 cubic feet, or an increase of 1,633,509 cubic feet; and the quantity unaccounted for, 2,453,801 cubic feet, which was equal to 3·86 per cent., against 3·82 per cent. in 1907-8. During the year, the Committee installed four settings of retorts on the regenerator system, which resulted in an increased production of 861 tons of coke for sale. The gross profit was at the rate of 13s. 7d. per ton of coal carbonized and 1s. 4d. per 1000 cubic feet of gas sold; and the net profit was 4s. and 4d. respectively.

TAUNTON AND THE ELECTRIC LIGHT.

"A Day of Reckoning" Predicted.

At a Meeting of the Taunton Town Council, last Tuesday, the Mayor (Alderman J. G. Price) presiding, the annual financial statement of the Electricity Committee was presented.

The Committee reported that they had within the last few days received a further communication from the Chamber of Commerce, which they proposed to consider at a special meeting. The new scale of charges for electricity came into force on the 1st inst. The Committee presented the electricity accounts for the year ending March 31. These showed a gross profit of £4070, to which must be added the sum of £25 received in respect of pupils' premiums, and also £43 brought forward from the last account, making altogether £4138.

Dr. Macdonald, Chairman of the Committee, in moving the adoption of the report, said he did not think it was altogether an unfavourable one. The gross profit, in the hands of a company, would have meant a dividend of 4½ per cent. They had carried forward over £5000 to the reserve fund, and had calculated 3½ per cent. for depreciation, which he thought was a fair amount. The total profit for the year was about £139 less than last year; and though the works at Taunton had been running on the same economical lines as before, he thought that the reduction in the profit could be put down to some extent to the introduction of Osram lamps.

Mr. Standfast, who has always been a fearless critic of the electric light, said he was sorry at the delay in considering the communication from the Taunton Chamber of Commerce. He would like to have seen it disposed of one way or the other, because it was not good for things to be deferred—unless it was to put off the evil day, which, he said, was bound to come some time or other. He regretted to hear the Chairman say that 3½ per cent. was a fair amount to allow for depreciation. At least 10 per cent. should be allowed; and if this was written off, it would mean £7000 a year to be provided for depreciation and sinking fund. While it cost more than 2d. per unit to produce the electric current in Taunton, the Committee had recommended the Council to sell it to the Tramway Company at less than 1½d. a unit. This showed that the Electricity Committee were not carrying on the works in a business-like way.

Alderman Spiller mentioned that he was recently reading an account of the Bristol Electric Light Works, where the Chairman had also complained that their income had gone down very considerably in consequence of the introduction of Osram lamps. The Committee could not help it if cheaper lamps were introduced.

Dr. Macdonald, replying on the discussion, said he could not understand why they should allow 10 per cent. depreciation, seeing that the electric light accounts were made up in accordance with the requirements of the Board of Trade. As a matter of fact, the works were paying off more than any other undertaking under similar conditions. They cost less to run than almost any other producing the same amount of current.

The report of the Committee, together with the financial statement, was then adopted.

MOSSLEY CORPORATION GAS UNDERTAKING.

The Past Year's Working—Reduction in Price.

The abstract of accounts of the Mossley Corporation, prepared by the Borough Accountant (Mr. Thomas Brooke), has lately been issued. It shows that the gas-rental in Mossley amounted to £8535, and in Saddleworth to £8361—together, £16,896. Deducting bad debts, the net rental was £16,891. Residuals produced £3600; and the total revenue was £20,833. The expenditure on the manufacture of gas was £11,293 (coals costing £7659); on distribution, £1120; on management, £363; and the total expenses were £14,932—leaving £5901 as gross profit. The instalments of sinking fund and the interest on loans absorbed £4186; leaving £1715 as the net profit for the year. Adding this to the balance brought forward made a sum of £3693, of which £1000 has been placed to a suspense account for the renewal of trunk mains in the

Saddleworth district, £160 had been transferred to the district fund in aid of the rates, and £1933 has been carried forward.

The following particulars as to working have been supplied by the Gas Engineer and Manager (Mr. James Taylor): Coal used, 11,708 tons; gas made, 126,226,200 cubic feet; gas sold, 114,456,200 cubic feet; gas unaccounted for, 11,770,000 cubic feet, or 9·31 per cent. on the amount supplied, compared with 9·38 per cent. for the year 1907-8. The quantity of gas sold was 991,000 cubic feet more than in the preceding twelve months; and the gas used on works showed a decrease of 564,000 cubic feet, due to the improved methods of lighting installed. Notwithstanding the bad state of trade, particularly in the cotton industry, the results of the year's working are regarded as satisfactory. The price of gas has consequently been reduced by 3d. per 1000 cubic feet as from the 25th of March last.

LIVERPOOL CORPORATION WATER SUPPLY.

Annual Report of the Engineer.

The Water Engineer to the Liverpool Corporation (Mr. Joseph Parry, M.Inst.C.E.) has just issued his annual report. It shows that the average quantity of water supplied per day from the works of the Corporation during the year ending Dec. 31 was 32,111,000 gallons; the corresponding average for the year 1907 being 30,928,000 gallons. There was consequently an increase last year of 1,183,000 gallons per day, or nearly 4 per cent., over the quantity supplied in the previous year. The maximum quantity of water consumed on any day last year was upwards of 47,000,000 gallons in winter and 36,500,000 gallons in summer. The total quantity supplied for the year was 11,688,443,000 gallons. The maximum demand in any one week was 263,403,000 gallons, and the minimum demand 172,958,000 gallons. The number of new tenants supplied with water in and around the city was 2633. The total number of tenants on the rent-roll of the department at the end of the year was 199,917.

Reference is made in the report to the legislation with regard to water charges during the year. It is pointed out that in considering any question affecting the water charges in Liverpool there are two important matters to be always kept in view; the first being that the water undertaking is not a trading concern, as the Corporation are not allowed to make any profit from the distribution of water within the compulsory area of supply. An estimate of the revenue and expenditure has to be made at the beginning of each year, and the water-rent has then to be fixed at an amount (within the maximum allowed by the Act) which will provide the necessary revenue after taking into account the yield of the 6d. rate and other receipts. The second matter to be remembered is that the bulk of the expenditure of the Water Committee is in respect of interest on capital, sinking and depreciation funds, and rates and taxes. The total expenditure on ordinary or revenue account for the year 1908, excluding Chorley, was £357,153, of which, excluding rates and taxes, only £77,104 was for working expenses. These are actually less than they were more than twenty years ago, although the population supplied with water has greatly increased during that period.

Nearly 15 miles of new mains were laid during the year in the city and the suburbs; and the total number of fire hydrants in the compulsory area is now 15,689.

The report also deals with afforestation at the watersheds at Rivington and Vyrnwy, and refers to new works which are in progress in connection with the supply from both sources.

SHEFFIELD CORPORATION WATER SUPPLY.

Inspection of Underbank and Langsett Reservoirs.

Alderman Styring, the Chairman of the Water Committee of the Sheffield Corporation, and Mrs. Styring recently entertained at their lodge at the Langsett reservoir the Water Committee, with the Lord Mayor and the Lady Mayoress and the members of the City Council. The object was to afford an opportunity of inspecting the Underbank and Langsett reservoirs and works; and, under the guidance of Alderman Styring, the General Manager (Mr. W. Terrey), and the Engineer-in-Charge (Mr. L. S. M. Marsh), an enjoyable afternoon was spent.

A special train conveyed a large party of ladies and gentlemen to Deepcar, where the coaches were transferred to the private railway. The Underbank reservoir and works were first inspected. Its drainage area is 3001 acres; its capacity, 650 million gallons; the area when the reservoir is full, 103 acres; its depth, 53 feet; and the length of the embankment, 1530 feet. The Langsett reservoir has a drainage area of 5203 acres, and a holding capacity of 1408 million gallons. Here the area of water surface when the reservoir is full is 124 acres, the depth 97 feet, and the length of the embankment 1156 feet. The work of the Engineer has been done in the most gratifying fashion. The huge hollow from which has been quarried all the stone used in the construction of the reservoirs and the embankments has been planted with shrubs, and a lake in the middle gives pleasure to the eye. Tea was provided in a large marquee, where the Lord Mayor voiced the thanks of the guests to Alderman Styring and Mrs. Styring. Afterwards the filter-beds, with which excellent progress is being made, were inspected. Congratulations to Mr. Terrey were general for the splendid work for which he has been mainly responsible in making this provision for the coming years. The amount expended on the Little Don Valley works up to March 25 last is £879,119. The population of Sheffield and those who are supplied with water in bulk now number 663,975; but there need be no fear as to the volume being less than the demand when the supply which will be added from Langsett supplements that from the other watersheds.

An assistant fitter (named W. J. Green) at the Fulham Station of the Gaslight and Coke Company, was brought up at the West London Police Court last Friday, on a charge of stealing brass cocks, &c., from stoves in the yard. Prisoner was remanded for a week.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The profits earned by the Hamilton Gas Department last year amounted to £1983. There had been brought forward £3946 from the previous year; so that the balance in hand was £5929. Out of this the Gas Committee recommended that £2000 be handed over to the Common Good of the burgh, that £1000 be applied in reduction of the capital cost of new plant, and that the balance be carried forward. These proposals were agreed to; it being the feeling of the Council that the £2000 should be applied to the reduction of the rates.

The Coatbridge Gas Company have been fortunate in getting the preamble of their Order passed by the Committee of the House of Lords. The Company have got all they asked for, in spite of the opposition of the Corporation, who, as was the case in Edinburgh last year, professed to see a sinister move in the proposal to reduce the illuminating power of the gas. The result—in both cases defeat of the Corporation—goes to show that Parliament is more enlightened than the municipalities.

The citizens of Dundee had an unpleasant experience with their Municipal Electricity Department last Wednesday afternoon; a fire in the central generating station leading to an entire stoppage of current, and, as a consequence, to the total withdrawal of light and power over the whole of the area of supply. The work of extinction was accomplished in half-an-hour; but some time elapsed before workmen could enter the basement of the station, owing to the heat. When they did enter, it was found that the cables, for a distance of 35 feet, would require to be renewed. Temporary provision was made; and after a stoppage of four hours, the light was restored, and power two hours later. As the municipal tramway system takes its power from the electric station, all the tramway cars stood in the streets where they were when the current left them. In many places where the electric light had been introduced, the gas-fittings had been removed; and in these recourse had to be had to candles for lighting. In other places, the gas-fittings had been retained; and in them there was a hasty furbishing up of incandescent burners and mantles. The King's Theatre was lighted by a combination of gas and candles. At the Town Council meeting the next day, Mr. Don, the Convener of the Electricity Committee, said it had seemed almost impossible that a fire should occur in the station. There was nothing of an inflammable nature about it. The only symptoms that were apparent at the time led them to the conclusion that nothing less than the presence of gas could have caused the explosion and the fire. It was practically inexplicable how the gas got there. The damage was comparatively small (estimated at £1200 or £1400), and was fully covered by insurance. An inquiry was being made into the incident, and a report would be submitted.

At the Dunfermline Town Council on Tuesday, the Clerk reported that at a meeting of the Gas Committee the previous day there was read a letter from the Clerk to the Dunfermline District Committee, enclosing a specification for the public and private lighting required within the area of Crossgates Special District, and inviting the Committee to lodge a sealed tender not later than 15th inst.; and that the Committee recommended that no action be taken. The Council agreed to the recommendation.

On Monday, a conference took place between three representatives of the Carnoustie Gas Company, three representatives of the Town Council, and three representatives of the ratepayers relative to the proposed gas transfer at Carnoustie. Ex-Provost Ramsay, one of the Directors of the Company, presided. Mr. Nicholl, a representative of the ratepayers, argued that the sum of £16,000 offered by the Town Council, was inadequate; while, on the other hand, he considered that the Company's valuation of £22,396, was too much. He had examined carefully the balance-sheets of the Company; and he thought a fair price for the undertaking would be £20,000. Ex-Provost Soutar, a representative of the Town Council, said that when the Council received the valuation of Mr. Silverthorne he was of opinion that his figure of £16,000 was an under estimate; and the Council were now prepared to offer £19,000. The Chairman said the Directors would take into careful consideration all the matters which had been discussed.

The Vale of Leven (Alexandria) Gas Company have paid a dividend of 5 per cent. The consumption of gas during the past year was about 3 million cubic feet less than the previous year. There was a smaller consumption in public works; but the public consumption showed an increase.

At the Selkirk Town Council meeting on Monday, Treasurer Bolster asked the Council to give their representative instructions as to the course he was to follow at the annual meeting of the Gas Company. He also wished that he should be relieved of the duty. The Company were going to convert their £5 shares into £20 shares. They were at present paying a 10 per cent. dividend and 2½ per cent. bonus, and carrying forward £559 after meeting their expenses during the year. They paid 12½ per cent. also last year, and made no reduction in the price of gas. He considered the report a most complete justification of the recommendation made by the Council, that the ratepayers should take over the works. He did not think anything could be done now, which would prevent the Company creating a £20,000 capital and paying 5 per cent. dividend upon it. The Company gave the Council a very good offer, and the ratepayers rejected it. It was for the Council now to consider what steps should be taken for the future. If they were to force the Company to become a statutory concern, they might prevent them in future adding to their capital what they had kept back in profits. He thought it should be remitted to the Law and Finance Committee to see what could be done to prevent the Company becoming a dead weight on the community. In the end, Treasurer Bolster was re-appointed to attend the meeting.

The report of the Directors of the Kirkcaldy Gaslight Company, Limited, gives the income for the past year as £23,935, and the expenditure £18,871; leaving a profit of £5064. An interim dividend of 3s. 6d. per share was paid in November last; and the Directors recommend a final dividend of 4s., which will require £2613. It is recommended that the price be retained at 3s. 2d. per 1000 cubic feet.

The Alloa Town Council have reduced the price of gas to ordinary consumers from 2s. 2d. to 2s. 1d. per 1000 cubic feet.

In the Broughty Ferry Town Council on Monday, Mr. J. P. Crystal, e Gas Convener, said that the gas budget was a success, due, he con- lered, to the careful and excellent management of Mr. Keillor. The timated consumption of gas had been exceeded by half-a-million bic feet. It was greater than ever it had been, even before the intro- iction of the electric light. He proposed a reduction of 2d. per 1000 bic feet all round, making the prices—to ordinary consumers, 2s. 10d.; consumers outside the burgh, 3s. 3d.; and to consumers using pre- yment meters, 3s. 2d. They had decided to make a new departure, d to charge a special rate for manufacturing purposes of 2s. 6d. per oo feet. The proposals of the Committee were agreed to.

The Directors of the Saltcoats Gas Company, Limited, reported to e shareholders at their annual meeting that the profit for the past ar amounted to £1541. A dividend of $7\frac{1}{2}$ per cent. was paid, and 341 carried forward. The quantity of gas made, from 2572 tons of al, was 27,085,000 cubic feet—equal to 9998 feet per ton. Gas unac- unted for amounted to 5 per cent. The revenue was £5071, of which 222 was derived from the sale of gas, £242 from tar and liquor, and 324 from coke. The cost of coal was £1772.

The Castle Douglas Gaslight Company have paid a dividend of 7 per nt., with a bonus of 3 per cent., and have reduced the price of gas om 3s. $11\frac{1}{2}$d. to 3s. 9d. per 1000 cubic feet.

In the annual report of the Directors of the Brechin Gas Company, mited, it is stated that there is a balance on the year's working of 142. The Directors recommend a dividend of 7 per cent., and that 32 be carried forward.

The Strichen Gaslight Company, Limited, a year ago reduced the ice of gas by 1s. per 1000 cubic feet. The Directors now report that ey have been able to pay their way and leave a small balance, not- thstanding. A dividend of 5 per cent. has been paid.

The Town Council of Burntisland have resolved to continue the ice of gas at 3s. 4d. per 1000 cubic feet. A new gasholder is being ected, and is expected to be ready for use in the autumn. The con- act price is £1840. The Contractors are the Barrowfield Ironworks, mited, of Glasgow.

The Ferry-Port-on-Craig, otherwise Tayport, Gas Company, Limited, e the owners of gas-works for which they do not possess a title. A pply of gas was introduced into Tayport in 1845, when a number of sidents formed a Company as a co-partnery. A site was procured d works erected, the title to which was taken in the name of Trustees. 1884, the co-partnery came to an end; and the present limited bility Company became the owners of the works. The Company d not complete their title to the works, and the Trustees have all died thout its being completed. In these circumstances, it has become cessary to apply to the Court of Session for authority to complete title. A petition to this effect was presented to Lord Mackenzie on ursday, and was by him directed to be intimated, by advertisement all concerned, and to be served upon representatives of the deceased rustees. A month ago the Town Council adopted a motion opening gotiations for the transfer of the Company's undertaking to them. robably it is this step which has brought the subject of title forward.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 17.

Sulphate of Ammonia.

There is no new feature to comment upon in the market, the tone remaining quietly steady, without any change in values. Supply continues sufficient for the present demand, and the quotations are still £11 1s. 3d. per ton f.o.b. Hull, £11 2s. 6d. to £11 3s. 9d. f.o.b. Liverpool, and £11 5s. to £11 6s. 3d. f.o.b. Leith. For forward delivery, no fresh transactions are reported, the ideas of makers and buyers being still too divergent to admit of business.

Nitrate of Soda.

This article has declined further, and to-day's values on spot are 9s. 9d. per cwt. for ordinary quality and 9s. $10\frac{1}{2}$d. for refined, *ex* store Liverpool.

LONDON, *July* 19.

Tar Products.

Markets have been steady throughout the past week, and in most cases prices have been well maintained. Pitch is very firm indeed. Although orders are still difficult to obtain (buyers resenting the advance), yet makers are advancing their quotations, and appear confident that they will realize them before very long. Creosote is steady. There is not very much doing just now; but there are important inquiries in the market which will have to be closed at an early date. Benzols are steady, with a good demand for near delivery. Solvent naphtha is quiet all round. Carbolic, 60's, is very dull; and business is reported at $11\frac{1}{4}$d. on the East Coast. Naphthalene is steady, and creosote salts firm. Tar is improving in sympathy with products, and in some districts is decidedly scarce.

The average values during the week were: Tar, 14s. 9d. to 18s. 9d., *ex* works. Pitch, London, 28s. to 29s.; east coast, 28s. to 28s. 6d.; west coast, 27s. 6d. to 28s. 6d. f.a.s. Mersey ports, 27s. 6d. to 28s. f.o.b. others. Benzol, 90 per cent., casks included, London, $6\frac{1}{2}$d. to $6\frac{3}{4}$d.; North, 6d. to $6\frac{1}{4}$d.; 50-90 per cent., casks included, London, 7d. to $7\frac{1}{4}$d.; North, $6\frac{3}{4}$d. to 7d. Toluol, casks included, London, $8\frac{1}{4}$d. to $8\frac{1}{2}$d.; North, $7\frac{3}{4}$d. to 8d. Crude naphtha, in bulk, London, $3\frac{1}{4}$d. to $3\frac{1}{2}$d.; North, 3d. to $3\frac{1}{4}$d.; solvent naphtha, casks included, London, $10\frac{3}{4}$d. to $11\frac{1}{4}$d.; North, $9\frac{1}{2}$d. to 10d.; heavy naphtha, casks included, London, $10\frac{1}{2}$d. to $10\frac{3}{4}$d.; North, $9\frac{1}{4}$d. to $9\frac{3}{4}$d. Creosote, in bulk, London, $2\frac{3}{4}$d. to $2\frac{13}{16}$d.; North, $2\frac{1}{2}$d. to $2\frac{3}{4}$d. Heavy oils, in bulk, $2\frac{7}{8}$d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 11d. to $11\frac{1}{4}$d.; west coast, 11d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, $1\frac{1}{2}$d. to $1\frac{3}{4}$d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been steady throughout the past week, and prices are a little firmer. Beckton prompt is £11 7s. 6d., and ordinary makes, on Beckton terms, £11. In Hull, £11 1s. 3d. to £11 2s. 6d. is quoted, and in Liverpool £11 2s. 6d.; while in Leith £11 7s. 6d. is now asked.

COAL TRADE REPORTS.

Northern Coal Trade.

There is some uneasiness in the coal trade, in consequence of the difficulty in Scotland; and this may cause prices to move with some rapidity. In the steam coal trade, this is more shown than in gas coals. Best Northumbrian steams are from about 12s. 9d. to 13s. per ton f.o.b., second-class steams are about 11s., and steam smalls are from about 5s. 6d. to 6s. 3d. The demand is fairly good for export, and the collieries are kept well working. In the gas coal trade, the tone is firm, and the demand good for the season; but the prices do not show so much alteration. Durham gas coals vary from about 10s. to 11s. per ton f.o.b., according to quality, for the usual classes; while for "Wear specials" up to 11s. 6d. f.o.b. is quoted. There is a contract in the market for about 20,000 tons for export; and it is thought that the prices which will be quoted will be somewhat near those that are named as current rates. There are inquiries for coal for certain of the Italian ports; but the prices offered are lower. There is thus some slowness in settling these sales. Coke is steady, and shipments of gas coke are rather fuller; the price being still from about 12s. 9d. to 13s. per ton f.o.b. for good quality.

Scotch Coal Trade.

The position has become still more serious, through the resolution to take a ballot of the miners in England and Wales as to a general strike in support of the Scotch miners. Users of coal are doing their best to lay in stocks. There are, in consequence, great activity and higher prices. The quotations are: Ell, 10s. to 11s. per ton f.o.b. Glasgow; splint, 10s. 6d. to 10s. 9d.; and steam, 9s. 3d. to 9s. 6d. The shipments for the week amounted to 350,478 tons—an increase upon the previous week of 4557 tons, and upon the corresponding week last year of 41,511 tons. For the year to date, the total shipments have been 7,743,593 tons—an increase upon the corresponding period of 565,061 tons.

Fatal Accident to a Gas Stoker.—The death of one of the stokers at the Beccles Gas-Works was the subject of an inquiry by the Suffolk County Coroner on Monday last week. The deceased—Henry Calver, a man of 65—was engaged in screwing up a bolt on a manhole cover on a boiler when it broke, and he fell back on to the steam-pipe, which he struck with the lower part of his body. In answer to a question by his mate as to whether he had hurt himself, he said he was all right. A day or two afterwards, he had to leave his work through illness and receive medical attention. Dr. Owles, who was called in, said the deceased told him of the accident, and repeatedly attributed his illness to it. In his opinion, the accident caused rupture of the diaphragm; pleurisy set in, pneumonia supervened, and deceased died from exhaustion. The Jury returned a verdict in accordance with the medical evidence.

Meldreth and Melbourn Gas and Water Company.—From an advertisement appearing in to-day's issue, it will be seen that the Meldreth and Melbourn District Gas and Water Company, Limited, are making issues of 10 per cent. £5 cumulative ordinary shares in the gas and water undertakings separately. The allotment, at par, will take place on the 28th inst. The London offices of the Company are at Norfolk House, W.C.; and the Secretary is Mr. F. C. Robus. These facts are pointed out in order that the concern may not by any chance be confounded with those unhappy ventures which have for some time past been emanating from No. 99, Cannon Street.

Price of Gas at Kenilworth.—Speaking at the annual meeting of the Kenilworth Gas Company, the Engineer (Mr. T. Berridge) said the undertaking was making good progress. They had recently reduced the price by 3d. per 1000 cubic feet, making 9d. in five years; and it was his earnest desire to see the figure down to 3s. Personally, that would be his endeavour. They owed a duty to the inhabitants of Kenilworth; and in making such concessions, they would render their position the more secure. The accounts were adopted, and a dividend at the same rate as previous years—viz., 7 per cent.—was declared on the ordinary shares, and 5 per cent. on the preference shares. The accounts showed an increase of $8\frac{1}{2}$ per cent. in the sale of gas.

Suicide of a Water-Works Manager.—A verdict of "Suicide while temporarily insane" was returned by the Coroner's Jury who inquired into the death of William A. Piercey (52), Works Manager of the South Hayling water undertaking. Deceased was found drowned in the water-tower tank; and it was stated in evidence that for a long time he had been taking too much drink, which had affected his health. It could be seen that he had rolled down the ladder into the tank; and an iron wheel was found tied round his neck. Mr. Hamilton Dunlop, the Secretary of the Company, said deceased had been in their employ seven or eight years, and was a good servant; but it had been necessary to speak to him about his drinking habits. The financial accounts were correct.

A Loss on Bradford Gas.—Under this heading, the "Yorkshire Daily Observer" says: "The gas undertakings of the Bradford Corporation for the year ended March 31 last have resulted, as was predicted some weeks ago in these columns, in a loss of about £5000. Those intimately associated with the work of the department are relieved to find that the loss is not greater. Various causes have contributed to this unfortunate result, some of which happily do not threaten to operate so adversely during the new year entered upon. The depressed state of trade last year could not fail to have its effect upon the consumption of gas; and there was a further decrease of income in the price received for residuals, while coal remained consistently dear, and the maintenance of plant has gone up between £2000 and £3000. The detailed report is not yet ready for publication. That there is a brighter outlook for the present year may be gathered from the fact that the Gas Committee have just let two large contracts for coal at a considerable reduction on the prices paid last year."

Gas and Electricity at Newport (Mon.).

At the monthly meeting of the Newport (Mon.) Town Council, derman Canning inquired whether the Electricity Committee were vare that in a large number of towns incandescent gas-lamps had for e most part been substituted for electric lamps. He asked that the ommittee, before coming to a decision on the subject, should have an dependent inquiry made as to the relative values of incandescent gas id electricity for lighting within a defined area. Mr. Charles said lderman Canning had omitted to state that in almost all the places e had mentioned the gas-works were owned by municipal authorities. e thought it was their duty, as a Corporation, who were rivals of an ntagonistic concern, to put their money into their own pockets. If lderman Canning was convinced that electricity was better than gas r lighting, would he instal it on the premises of the Gas Company? Ir. F. Phillips, the Chairman of the Electricity Committee, said all ese questions had been considered. The Corporation offered a good ght at a less price than the Gas Company charged. The Committee's ecommendation to light a number of streets with Osram lamps was dopted.

Water Supply to Drinking Fountains and Hydrants.

At the meeting of the Metropolitan Water Board last Friday, the ppeal and Assessment Committee reported the receipt of a memorial rom nineteen of the Metropolitan Borough Councils on the subject of ne Board's Charges Act. The memorialists stated that they, being ocal authorities existing entirely for the public convenience and health, nd not for commercial purposes, were of opinion that the increased harges proposed to be levied upon them would be likely to lead to recautions being taken to avoid the proper use of water for sanitary nd health purposes. They suggested (*inter alia*), with respect to the upply of water to water-troughs and drinking fountains, that a fixed harge of 6d. per 1000 gallons should be adopted for this form of supply, nd also that, where the fountains were controlled by spring valves, the vater supply should be afforded at the rate of 1s. per valve per annum, nd for recreation grounds or public parks at the rate of 6d. per 1000 allons. They further stated that for the supply to hydrants provided n licensed public buildings, the charge should be made at a more easonable rate than 21s. for each hydrant. The Committee, in a long eport, recommended that the Board express their inability to extend he meaning of "public purposes" as defined in section 37 of the Water-Works Clauses Act, 1847, by adding thereto supplies to water troughs and drinking fountains, and also on financial grounds, to modify the existing charge of £1 1s. per sealed hydrant per annum in respect of private fire supplies. To the motion for the adoption of the report an amendment was submitted to refer the recommendation back to the Committee; but it was rejected by 21 votes to 19. The recommendation was agreed to.

Devonport Corporation Water Department.

The accounts of the Devonport Corporation Water Department for the year ending the 31st of March show that the gross income was £19,772 against £17,688 in the preceding year. The working expenses were £5736, so that there was a balance of £14,036 to carry to the profit and loss account. After payment of £10,696 for interest and £1058 as an instalment of the loan, there remained a net profit of £2282, which was put to the reserve fund. A considerable addition was made to the capital expenditure during the past year, owing to the fact that a pipe was substituted for a portion of the open leat; and a new reservoir is under construction. The capital now employed is £310,231, which is equal to £318 per million gallons of water supplied. The average daily output is 2,666,734 gallons; the domestic consumption being estimated at 24·68 gallons and the non-domestic at 11·83 gallons per head. In moving the adoption of the report at the last meeting of the Town Council, Alderman Blackall, the Chairman of the Water Committee, said that during the past year they had paid off the last instalment of the cost of the Act of Parliament. They had now a reserve or contingent fund of £2807; and during the next five years they would have to make strenuous exertions to increase it, so as to meet the greater liability that would come upon them when the formation of the sinking fund began. No doubt the time would arrive when a small demand would have to be made on the ratepayers. Up to the present, however, the water-works had not cost them anything; and they would not do so until the reserve fund now accumulating was exhausted. The new reservoir was being carried out by their Engineer (Mr. F. W. Lillicrap) by direct labour; and the Committee were very pleased with the way in which the work was being done.

Expert Advice to be Taken at Colwyn Bay.

In moving, at the meeting of the Colwyn Bay District Council, the adoption of a recommendation of the Lighting Committee that expert advice be taken with a view to putting the gas undertaking on a sound business footing, Mr. J. Dicken, the Chairman, said that when the concern was taken over in 1902 the price of gas was 4s. 2d. per 1000 cubic feet; the charge for cooking purposes being 3s. 4d. In the first year, the profit made was £486, and in the following year it was £1947. The price had now been reduced to 3s. 4d. all round. Since 1905, gas had been supplied at 2s. per 1000 cubic feet for street lighting purposes; and £800 a year had been given in relief of the rates. Last year the huge sum of £21,000 was expended in constructing railway sidings, an elevator, &c., which meant an addition of £1100 to the payments for interest and sinking fund. Mr. G. Bevan said the Committee were clearly suffering from panic, and were depreciating the value of their own property. All an expert could tell them to do was to reduce the leakage and increase the yield from the coal. Messrs. Newbigging and Son will advise the Council.

Sale of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards sold, under instructions from trustees and others, a number of gas shares, for which there was keen competition. The first lots offered consisted of consolidated ordinary stock of the Enfield Gas Company, ranking for a standard dividend of 5 per cent. per annum, subject to the sliding-scale; the dividends for the 5½ years ended Dec. 31 last having been at the rate of 5⅛ per cent. per annum. All the stock was disposed of at from £118 to £120 per £100; returning the purchasers at the latter price, on the present dividend, £4 11s. 8d. per cent. Next came a few fully-paid £2 original shares in the Ware Gas Company, Limited, carrying 10 per cent. dividend, which fetched £3 16s. to £4 each; and some £10 original shares in the Hertford Gas Company, bearing a like dividend, £19 7s. 6d. to £19 12s. 6d. apiece. A small parcel of the Harrow and Stanmore Gas Company's "A" £10 shares, the last dividend on which was at the rate of 10½ per cent. per annum, were sold for £22 each; a few of the Company's fully-paid "B" shares of like nominal value, but carrying 7 per cent., for £14 2s. 6d. apiece; and "C" £10 shares, bearing £7 7s. per cent., for £15 5s. apiece. The last lots were fully-paid £10 shares in the West Kent Gas Company, ranking for a maximum dividend of 10 per cent., which has been paid for the past ten years; and they fetched £20 per share.

Ashford Gas Supply.—In the last number of the "Journal" (p. 136), some figures were given from the report of Mr. Herbert R. Turner, the Gas Engineer and Manager of the Ashford Urban District Council, on the working of the undertaking in the past financial year. By way of supplementing those particulars, it may be mentioned that the sale of gas through ordinary meters realized £7852, or an increase of £98 compared with 1907-8; while that through slot-meters came to £3238, or £285 more. The total amount realized for residuals was £3248, a decrease of £107, which was more than accounted for by the larger quantity of carburetted water gas made. With regard to manufacturing operations, 6248 tons of coal were carbonized, which produced 64,648,000 cubic feet of gas; while for the manufacture of 9,170,000 cubic feet of carburetted water gas 24,416 gallons of oil and 147·5 tons of coke were used, equal respectively to 2·66 gallons and 36·03 lbs. per 1000 cubic feet. Since 1898, when the Council acquired the works, the demand for gas has necessitated an increased make of no less than 35,921,200 cubic feet, or 194·8 per cent. in eleven years. During the past year, 1266 yards of new mains were laid; making a total of 15 miles, equal to 162 consumers, or an average of 4,472,000 cubic feet of gas sold, per mile. The total number of consumers on the books at the close of the year was 2430, of which 1260 were on the prepayment system. The number of stoves now in use is 1161; and there are 258 public lamps.

Gas v. Electricity.—The following remarks on this subject appeared under the heading of "Home Industries" in a recent number of the "Journal of the Royal Society of Arts." "Two or three years ago, it was argued at some length in these Notes that as an illuminant gas was likely to be a much more formidable rival of electricity than was generally supposed; and therefore the prevailing assumption that electricity must oust gas was by no means demonstrable. It was contended that as to convenience there was little to choose between the two, since by means of a bye-pass on the burner, instantaneous light without the aid of matches can be secured by gas; while in the matter of cost the advantage was decidedly with gas. Since then the comparative advantages of gas have become much more apparent to the ordinary consumer. It is not only that gas may be as convenient and is much cheaper, it is more dependable. Breakdowns with electricity, over the whole supply as well as individual cases, are not uncommon; but with gas there is no such irritating possibility. From whatever point of view the comparison is made between gas and electricity, except perhaps in the matter of cleanliness, the former holds its own; while the saving in cost is very great. It may be safely said that, speaking generally, electricity is twice as expensive as gas, and, under certain conditions, the ratio is even higher. The present position of the rival illuminants is in striking contrast to what it would have been if the predictions of the experts a few years ago had been fulfilled. Many gas consumers were frightened into the belief that gas companies would soon be within sight of bankruptcy. Their outlook to-day is much brighter than ever. This, of course, is largely due to the rapidity with which gas is superseding coal as a heating agent. It is more convenient in every way; and with the substitution of gas for coal, the atmosphere of great towns, and more especially London, must be immensely improved."

APPLICATIONS FOR LETTERS PATENT.

15,621.—Eberhard, E., "Cooking-stove." July 5.
15,643.—Richards, R. S., and Pringle, R. W., "Distilling coal and recovery of the products." July 5.
15,661.—Thomas, W., "Gas-producer." July 5.
15,768-9.—North, R. B., "Gas-governors." July 6.
15,797.—Tate, W. H., "Gas-engines." July 7.
15,911.—Palmer, F., "Suction producers." July 7.
16,025.—Evered and Co., Ltd., and Danks, J. T., "Taps or stop-cocks." July 9.
16,065.—Heinrich, W., "Forming carburized metal filaments in gases." July 9.
16,070.—Ratner, I., "Incandescent gas-lamps." July 9.
16,084.—Morris, H. J., "Protective device for gas-meters." July 9.
16,091.—Kirschke, E., "Inverted burners." July 9.
16,123.—Portugall, C., "Gas-saver." July 10.
16,127.—Yarrow, M., "Pipes, retorts, &c." July 10.
16,138.—Sutherland, J. C., and the Sutherland Meter Company, Ltd., "Indexes for gas-meters." July 10.
16,139.—Sutherland, M. C. & W. C., "Meters." July 10.
16,141.—Hibberd, C. E., "Coin-freed mechanism." July 10.
16,161.—Kocken, E., and Meeteren, B. T. A. W. van, "Valves for gas-burners." July 10.

South Molton Water Supply.—The Local Government Board have not granted the application of the South Molton Town Council for a loan of £750 for the provision of filters at the water-works. It is the opinion of the Board that the mains and pipes are inadequate, in their present condition, to furnish a proper supply of water to the town, and that in this and other respects the water-works need improvement. They therefore advise the Council to reconsider the whole subject, and submit a comprehensive scheme, to include the relaying of the mains and pipes where necessary, and the covering of the service reservoir. It was also suggested that expert advice should be obtained as to the possibility of removing the incrustation of the mains by means of a scraping-machine; and doubt is expressed by the Board as to whether the filters proposed to be installed will be effective in preventing the incrustation.

Mansfield Gas and Water Supply.—The reports of the Mansfield gas and water undertakings for the past financial year are of a satisfactory character. In regard to the gas undertaking, the total gross profit is £6814. After allowing for interest on loans and contributions to sinking fund, a net profit remains of £1567. The amount received from the sale of gas is about £1000 more than in the previous year, and the expenditure on manufacture about £450 more—this being principally accounted for by repairs and maintenance of works. The Committee have decided that the sum of £1200 be paid over to the general district rate, and the balance of profit appropriated to the reserve fund. The total income in connection with the water-works amounts to £10,813, compared with £10,321 the previous year. The expenditure, apart from dividends, interest, and sinking fund, was £4081, as against £3090. The gross profit amounts to £6732. After payment of interest on loans and contributions to sinking fund, a net profit of £2234 is left. This is somewhat less than last year, and is accounted for by the increased cost of coal, additional expenditure in parliamentary costs, and temporary plant at Clipstone. The Committee have decided to pay over the sum of £2000 to the general district rate, and to appropriate the balance to the reserve fund.

Manchester Street-Lighting Experiments.—The "Yorkshire Daily Observer" last Tuesday contained the following: "At Manchester, as in Bradford and Leeds, experiments have been in progress as to the relative values of gas and electricity for street lighting. One thing, at least, has been settled at Manchester, and that is the desirability of abolishing, if possible, the system of lighting by means of standard lamps. An experiment has been going on for some time past in suspending electric lights in the air over the middle of certain streets—as is done in Boar Lane, Leeds. This has been so successful that the Corporation are now going to try another experiment, this time with gas. There are, of course, greater difficulties to be overcome in suspending gas-lamps than there are in dealing with the electric light. The pipes to carry the gas have to be stronger than the wires which convey electric current; and there are junctions to be formed which must not be allowed to leak. If the experiment is as satisfactory as the electric one, a new field in gas lighting will be opened up."

The Local Government Board have refused to sanction a loan asked for by the Dover Corporation for the purpose of extending the electricity supply to St. Margaret's. The grounds given by the Board for this refusal are that they are not satisfied that the proposed expenditure on the work would be sufficiently remunerative.

On a report from the Gas Committee being presented to the Walsall Town Council, Alderman Noake drew attention to a statement that an application by the Sewage Farm Committee for a supply of gas on reduced terms had been refused, and moved as an amendment that this part of the report be referred back for further consideration, on the ground that the request was only a reasonable one. The Mayor (Mr. W. Millerchip) had no objection to the subject of the charges for power purposes receiving further consideration; but the Committee felt that they should apply to any Corporation department the principle which held good with regard to other customers—namely, that the price charged should not be unremunerative. The amendment was negatived, and the report adopted.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 163.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17¾—18¼	..	5 9 7
298,955	10	"	7	Do. 7 p.c.	12½—13	..	5 7 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98*	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd.	5⅝—5⅞	+⅛	5 10 8
40,000	5	"	6½	Do. New, £4 paid .	4⅜—4⅝	+⅛	5 12 5
50,000	10	Feb. 25	14	Bournemouth Gas and Water } 0 p.c. . .	28¾—29¼	..	4 15 9
51,810	10	"	7	Do. B 7 p.c. .	16¾—17	..	4 2 4
53,200	10	"	6	Do. Pref. 6 p.c.	15⅝—15⅞	..	3 15 7
380,000	Stk.	"	12½	Brentford Consolidated	254—257	−1	4 17 3
300,000	"	"	9½	Do. New . . .	195—197	+1	4 16 5
50,000	"	"	5	Do. 5 p.c. Pref. .	122—124	..	4 0 8
206,250	"	June 11	4	Do. 4 p.c. Deb. .	100—102	..	3 18 5
220,000	Stk.	Mar. 12	10¾	Brighton & Hove Orig.	212—214	..	5 0 6
246,320	"	"	7¾	Do. A Ord. Stk. .	154—156	..	4 19 4
460,000	20	Apl. 16	10	British	43—43½	..	4 11 11
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c. . .	119—121	..	4 19 2
165,700	"	"	4½	Do. B 3½ p.c. . .	89—91	..	4 18 11
82,278	"	"	5½	Do. C 5 p.c. . .	108—110	..	5 0 0
55,000	"	June 25	3½	Do. 3½ p.c. Deb. .	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13¾—14¼	..	4 18 3
250,000	Stk.	June 25	4	Do. 4 p.c. Deb. .	92—94	..	4 5 1
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	+½	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord. . .	109—111	..	4 10 1
1,493,280	Stk.	Mar. 12	5 2/10	Commercial 4 p.c. Stk. .	108—110	..	4 14 6
560,000	"	"	5	Do. 3½ p.c. do. .	104—106	..	4 14 4
475,000	..	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	"	5	Continental Union, Ltd.	96—98	..	5 2 0
200,000	"	"	7	Do. 7 p.c. Pref.	137—139	..	5 0 9
492,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4 1 4
55,000	"	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
148,995	"	Mar. 31	5	East Hull 5 p.c. Ord. .	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd. . . .	24¼—24¾*	..	4 17 0
354,060	10	"	12	Do. £7 10s. paid.	18¼—18¾*	..	4 16 0
15,161,545	Stk.	Feb. 11	4/10/8	Gas light and Coke } 4 p.c. Ord. . .	103½—104½	+½	4 6 7
2,600,000	"	"	3½	Do. 3½ p.c. max. . .	88—90	..	3 17 9
3,799,735	"	..	4	Do. 4 p.c. Con. Pref.	105—107	+1	3 14 9
4,193,975	"	June 11	3	Do. 3 p.c. Con. Deb.	85½—86½	+½	3 9 4
258,740	Stk.	Mar. 12	4¾	Hastings & St. L. 3½ p.c.	93—95	..	5 0 0
82,500	"	"	6¼	Do. do. 5 p.c.	118—120	..	5 4 2
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17½—18	..	6 2 3
123,570	Stk.	Mar. 12	6½	Ilford A and C . . .	141—143	..	4 10 11
65,780	"	"	5	Do. B	106—108	..	4 12 7
63,000	"	June 25	4	Do. 4 p.c. Deb. . . .	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental .	179—181	..	4 8 5
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c. .	120—122	..	4 18 4
561,000	Stk.	Feb. 25	10	Liverpool United A .	226—228	..	4 7 9
718,100	"	"	7	Do. B . .	168—170	..	4 2 4
306,083	"	June 25	4	Do. Deb. Stk.	103—105	..	3 16 2
75,000	5	June 11	6	Malta & Mediterranean.	4⅞—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met of Melbourne } 5 p.c. Deb.	100—102	..	4 18 1
250,000	100	"	4½	Do. 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	May 27	3½	Monte Video, Ltd. . .	12½—13	..	5 7 8
1,775,892	Stk.	Feb. 25	4½	Newc'tle & G'tesh'd Con.	107½—108½	..	4 2 11
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	91—93	..	3 15 3
15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½—20	..	5 0 0
55,940	10	"	7	Do. 7 p.c.	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	137—139	..	5 15 1
60,000	5	Mar. 31	8	Ottoman, Ltd. . . .	6⅛—6⅜	..	6 5 6
31,800	53	Feb. 25	13	Portsea Island A. . .	138—140	+1	4 18 4
60,000	50	"	13	Do. B. . .	130—132	+1	4 18 6
100,000	50	"	12	Do. C. . .	120—122	+1	4 18 4
114,800	50	"	10	Do. D and E.	102—104	+1	4 16 2
398,490	5	May 13	7	Primitiva Ord. . . .	6⅞—7⅛	+⅛	4 18 3
796,980	5	Jan. 28	5	Do. 5 p.c. Pref. .	5¼—5½	..	4 10 11
483,900	100	June 1	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
1,000,000	10	Apl. 29	8	River Plate Ord. . .	15¾—16¼	+1	4 18 6
312,650	Stk.	June 25	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	14—14½	..	5 10 4
62,500	10	"	6	Do. 6 p.c. Pref. .	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49½—50½	..	4 19 0
135,000	Stk.	Mar. 12	10	Sheffield A	236—238	..	4 4 0
209,984	"	"	10	Do. B	233—235	..	4 5 1
523,500	"	"	10	Do. C	233—235	..	4 5 1
70,000	10	June 11	10	South African	13⅛—14	..	7 2 10
6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	122—124	..	4 6 0
1,895,445	"	July 14	3	Do. 3 p.c. Deb.	84½—85½*	+½	3 10 2
209,820	Stk.	Mar. 12	8	South Shields Con. Stk.	153—155	+1	5 3 3
605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120—122	..	4 10 2
60,000	"	"	5	Do. 5 p.c. Pref. .	122—124	..	4 0 8
117,058	"	July 14	5	Do. 5 p.c. Deb. Stk.	122—124*	+½	4 0 8
502,310	Stk.	May 13	5	Southampton Ord. . .	110—112	..	4 9 3
120,000	Stk.	Feb. 25	6¾	Tottenham and Edmonton } A 5 p.c. .	132—134	..	5 0 9
423,940	"	"	5¼	Do. B 3½ p.c. .	111—113	..	4 12 11
149,470	"	June 25	4	Do. 4 p.c. Deb.	99—101	..	3 19 3
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	110—112	+1	4 9 3
255,656	Stk.	Feb. 25	6½	Wandsworth } B 3½ p.c. . .	139—141	..	4 12 2
79,416	"	June 25	3	Do. 3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	"	Feb. 25	5¼	West Ham 5 p.c. Ord. .	121—123	..	4 5 4
210,000	"	"	5	Do. 5 p.c. Pref. . .	126—128	..	3 18 2
253,300	"	June 25	4	Do. 4 p.c. Deb. Stk..	105—107	..	3 14

Prices marked * are "Ex div."

At a recent meeting of the Bangor (Co. Down) Gas Committee, it was announced that twenty-four firms had tendered for the year's supply of coal, amounting to from 3000 to 3500 tons; and the tender of the G. J. Eveson Coal and Coke Company, Limited, of Birmingham, was accepted.

After providing for debenture interest, the accounts of the Seville Water-Works Company for the year ended March 31 show a net profit of £18,130, inclusive of £13,422 brought down. The Directors recommend the payment of a dividend of 2 per cent. and the transfer of £2582 to the reserve (raising it to £5000); carrying forward £10,125.

At Haywards Heath (Sussex), George Grace, an Albourne engine driver, has been fined £4 and costs for taking water from the pipes of the Mid-Sussex Joint Water Board. The Cuckfield parish authorities instituted the proceedings, the answer to which was that the defendant was under the impression that the pipes were the property of the Burgess Hill Water Company.

The employees of the East Hull Gas Company and their wives recently had a very pleasant day at Scarborough, on the occasion of their annual outing. Dinner was served at the Olympia Restaurant at noon—the General Manager and Engineer, Mr. J. Holliday, being in the chair. Mr. J. J. Runton, the Chairman of the Company, and Mr. Alderman Robson, a Director, were also present. Mr. George Taylor, in moving a vote of thanks to the Directors, referred to the rapid strides the business of the Company has made in recent years, and coupled with the vote the name of Mr. Runton, who has been a Director for nearly fifty years, and Chairman for more than twenty. He also expressed the pleasure of the employees at the presence of Alderman Robson. Mr. Runton, in reply, said the Directors were pleased to give the outing, and testified to their appreciation of the good work done in all departments of the Company. Mr. Brigden proposed a vote of thanks to Mr. Holliday for taking the chair; saying his uniform kindness and consideration for the employees were known to them all. The vote was carried by acclamation, and Mr. Holliday replied.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure Insertion in the following day's Issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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THE AIR LIGHT COMPANY.
(In Liquidation.)

OFFERS are invited for the Assets of the above, including SIX PATENTS FOR APPLIANCES, comprising a Complete and Efficient System of High-Pressure Gas Lighting with Compressed Air, which have been WORKING SUCCESSFULLY FOR SOME TIME, and for the Stock, Fixtures, and Plant, including Glass, Patent Fittings, Lathe, Gas-Engine, &c.
Further Particulars from
The Liquidators,
7a, New Street Cottages,
Wilton Road, S.W.

THE Haworth Urban District Council are prepared to receive TENDERS for the Supply of 2500 Tons of GAS COAL (Screened, Unscreened, and Gas Nuts) delivered at the Haworth Station during the ensuing Twelve Months.
Sealed Tenders, endorsed "Gas Coal Tender," to be forwarded to me, the undersigned, not later than the 26th inst.
No Special Form of Tender.
William Robertshaw,
Clerk to the Council.
1, Burlington Chambers,
North Street, Keighley.

MANCHESTER CORPORATION GAS-WORKS.

TENDERS FOR CANNEL, COAL, AND NUTS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the Supply of their requirements of CANNEL, Screened COAL, and Screened NUTS (Unwashed) during One or Two Years at their Gaythorn, Rochdale Road, Bradford Road, and Droylsden Works. Delivery to commence on the 1st day of September, 1909.
The Tender must state at what Colliery the material offered is raised, and give the size of the mesh of the Screen over which it is passed, with the angle of inclination of the Screen.
Printed Forms of Tender may be obtained on Application (in writing only) to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester, and Tenders, endorsed "Tender for Cannel" or "Coal" or "Nuts," as the case may be, must be delivered at the Gas Department, Town Hall, Manchester, before Ten o'clock on Thursday morning, the 29th of July, addressed to the Chairman of the Gas Committee.
The Gas Committee do not bind themselves to accept any Tender, and reserve to themselves the right to divide any Offer as they may deem advisable.
By order,
Wm. Henry Talbot,
Town Clerk.
Town Hall, Manchester,
July 16, 1909.

RHYL URBAN DISTRICT COUNCIL.
(Gas Department.)

THE above Council invite Tenders for the Surplus TAR and LIQUOR produced at their Gas-Works from Aug. 1, 1909, to the 30th of June, 1910.
The estimated quantity of Tar for the Eleven Months is 200 Tons; and of Liquor, 650 Tons.
Delivery into Contractor's 200 Gallon Tanks at Rhyl Station.
Sealed Tenders, addressed to the undersigned, and endorsed "Tenders for Tar and Liquor," to be delivered not later than July 28, 1909.
The Council do not bind themselves to accept the highest or any Tender.
Arthur Rowlands,
Clerk to the Council.
July 13 1909.

RHONDDA URBAN DISTRICT COUNCIL.
(Gas and Water Department.)

TENDERS FOR GAS COALS.

THE Council are prepared to receive TENDERS for the Supply of about 20,000 Tons of Through and Through GAS COALS, delivered at the Porth and Ystrad Gas-Works, for the Twelve Months ending the 30th of June, 1910.
Specification and Form of Tender can be obtained on Application to the Engineer and Manager, Mr. Octavius Thomas, Gas and Water Offices, Pentre, Rhondda.
The Contractors will be required to pay the standard rate of wages recognized in the District.
Tenders, to be addressed to the Chairman of the Gas and Water Committee, endorsed "Tender for Gas Coal," and delivered at my Office not later than Ten a.m. on Friday, July 30, 1909.
The Council do not bind themselves to accept the lowest or any Tender.
Walter P. Nicholas,
Clerk to the Council.
Public Offices, Pentre,
Rhondda, July 13, 1909.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at De Keyser's Royal Hotel, Victoria Embankment, in the City of London, on Wednesday, the 11th day of August next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June last; and to declare a Dividend for the same period.
The TRANSFER BOOKS WILL BE CLOSED from the 28th day of July inst. until after the Meeting.
By order,
F. M'Leod,
Secretary.
Offices: 709, Old Kent Road,
London, S.E., July 17, 1909.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the De Keyser's Royal Hotel, Victoria Embankment, London, E.C., on Friday, the 6th day of August, 1909, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th day of June last; to declare a Dividend for the same period; and for General Purposes.
The TRANSFER BOOKS WILL BE CLOSED from the 23rd day of July, until after the Meeting.
By order of the Board,
Charles M. Ohren,
Secretary.
Offices and Works:
Lower Sydenham, S.E.,
July 19, 1909.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Gas-Works, Willoughby Lane, Tottenham, on Saturday, the 7th day of August next, at 3.30 o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ending June 30, 1909; to declare Dividends; to elect Two Directors and an Auditor for the ensuing Year; to consider the Salary of the Secretary with a view to its increase; and to transact General Business.
The TRANSFER BOOKS for the "A" and "B" CONSOLIDATED STOCKS WILL BE CLOSED from July 26 to Aug. 7, both days inclusive; and the Dividends will be posted on the 14th of August to the holders of Stock registered at the date of the closing.
By order of the Board,
E. Topley,
Secretary.
Chief Offices of the Company:
High Road, Tottenham,
July 16, 1909.

WEST HAM GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors of this Company will be held at the Abercorn Rooms, Liverpool Street Hotel, E.C. (Bishopsgate Street entrance), on Tuesday, the 10th day of August, 1909, at 12.30 p.m. o'clock precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ending the 30th of June, 1909; to declare a Dividend; and for other General Business.
The TRANSFER BOOKS of the Company, so far as they relate to CONSOLIDATED ORDINARY and to PREFERENCE STOCKS, WILL BE CLOSED from the 28th of July to the 10th of August, both days inclusive.
By order of the Board,
A. G. Snelgrove,
Secretary.
Gas-Works, Stratford, E.,
July 17, 1909.

EUROPEAN GAS COMPANY, LIMITED.

SHARE WARRANTS TO BEARER.

NOTICE is Hereby Given, that, in accordance with a Resolution passed at the ANNUAL GENERAL MEETING of Shareholders held on the 13th inst., a Dividend and Bonus of Fourteen Shillings per share will be payable on and after the 31st inst., on the above Shares, subject, however, to a deduction of 1s. 1d. per share for French Stamp and Transfer Duty.

Payment will be made at the Union of London and Smith's Bank, Limited, Princes Street, London, E.C., after Serial Coupon No. 69 has been left Three clear days for examination.

W. WILLIAMS,
Secretary and General Manager.

Finsbury House, Blomfield Street,
London, E.C., July 13, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

EPSOM AND EWELL GAS COMPANY.

NEW ISSUE OF £8000 CONSOLIDATED ORDINARY STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Monday, July 26, at Two o'clock, in Lots.

Particulars of the AUCTIONEERS, 18, FINSBURY CIRCUS, E.C.

NEWCASTLE AND GATESHEAD WATER COMPANY.

TO Be Sold by Auction, in the Board Room of the Company's Office, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, July 27, 1909, at Half-Past Twelve o'clock precisely, by Mr. Chas. A. Joel, in such Lots as are provided for in the Company's Act of 1902,

£45,000 (or thereabouts) of FIVE PER CENT. PREFERENCE STOCK (1902),

being such amount as will make up, with the Premiums thereon, the balance of Preference Stock authorized to be issued under such Act.

Printed Particulars and Conditions of Sale may be had at the Company's Offices.

GEORGE SMITH,
Secretary and General Manager.

Newcastle-on-Tyne, June 16, 1909.

MELDRETH AND MELBOURN DISTRICT GAS AND WATER COMPANY, LIMITED.

ISSUE OF

1163 TEN PER CENT. £5 CUMULATIVE ORDINARY SHARES in the Gas Undertaking.

1316 TEN PER CENT. £5 CUMULATIVE ORDINARY SHARES in the Water Undertaking.

THE Directors, in accordance with their Provisional Order, invite APPLICATIONS for the above Shares at Par.

The Allotment has been fixed for Wednesday, July 28, at Two o'clock.

Application Forms and all Information can be obtained from the London Offices.

By order of the Board,
F. C. ROBUS, F.C.I.S.,
Secretary.

Norfolk House, Norfolk Street,
Strand, London, W.C.

THE Owner of British Patents Nos. 13,861 of 1906, entitled "IMPROVED PROCESS FOR THE PREPARATION OF PURE METHANE OR OF A GASEOUS MIXTURE RICH IN METHANE," and 15,326 of 1906, entitled "IMPROVED PROCESS FOR THE MANUFACTURE OF A GASEOUS MIXTURE CONTAINING HYDROGEN AND METHANE," is desirous of DISPOSING of the PATENTS or entering into a WORKING ARRANGEMENT UNDER LICENCE, with Firms likely to be interested in the same, or he would be open to consider a proposal to carry out or use the Inventions to fill any requirements of the English Market on Terms to be arranged.

The Patents cover Inventions interesting to Manufacturers of Gas Producers, Chemical Plant Manufacturers, &c.

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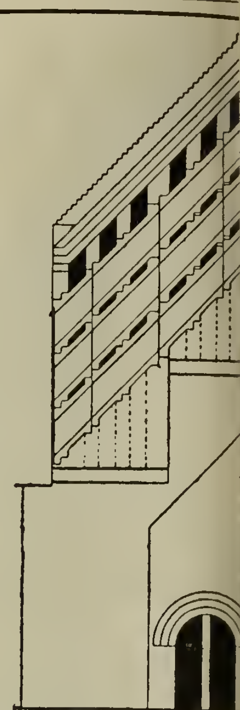

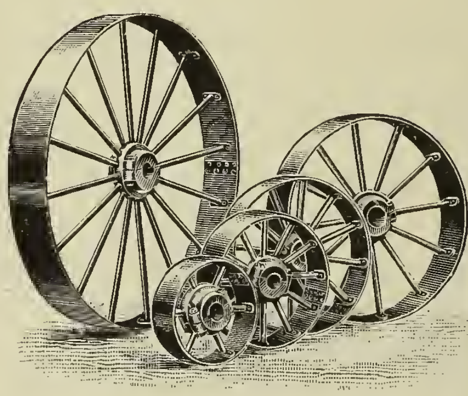

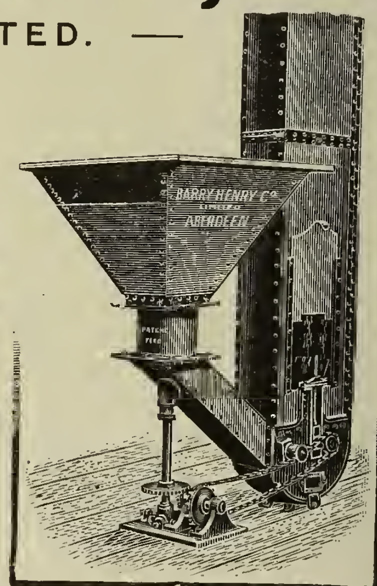

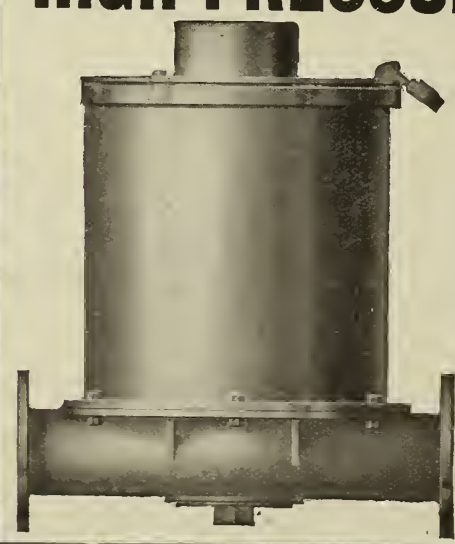

Welsbach
LIGHT
Inverted Arc Lamp, Fig. 623.

Storm Proof—
r Exterior Lighting.

BRITISH MADE.

Height over all.

-light . . .	1 ft. 8 ins.
-light . . .	2 ft. 1 in.
-light . . .	2 ft. 4 ins.
-light . . .	2 ft. 7 ins.

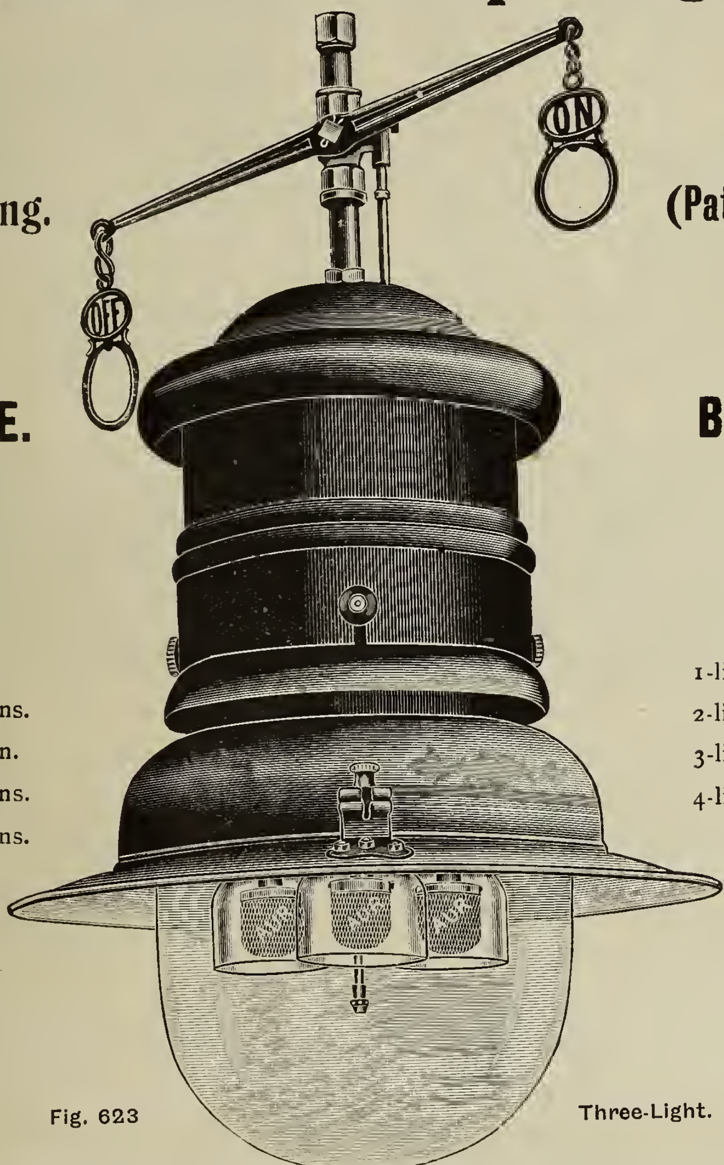

Fig. 623 Three-Light.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 4 ins.
3-light . . .	1 ft. 6 ins.
4-light . . .	1 ft. 8 ins.

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	Gas per hour.	*C.P.*	*Steel.*	*Copper Case.*
light	4 feet	125	**30/-**	**5/-** extra.
light	8 feet	260	**47/6**	**6/-** extra.
3-light	12 feet	400	**52/6**	**6/-** extra.
4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
ear Glass Globes, each	**2/3**	**4/-**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**42/9**	**57/9**	**93/-**
Case contains . .	*80*	*48*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, each **6d.** subject as usual.

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WATER SUPPLY & SANITARY IMPROVEMENT

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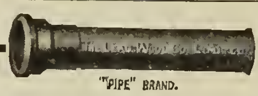

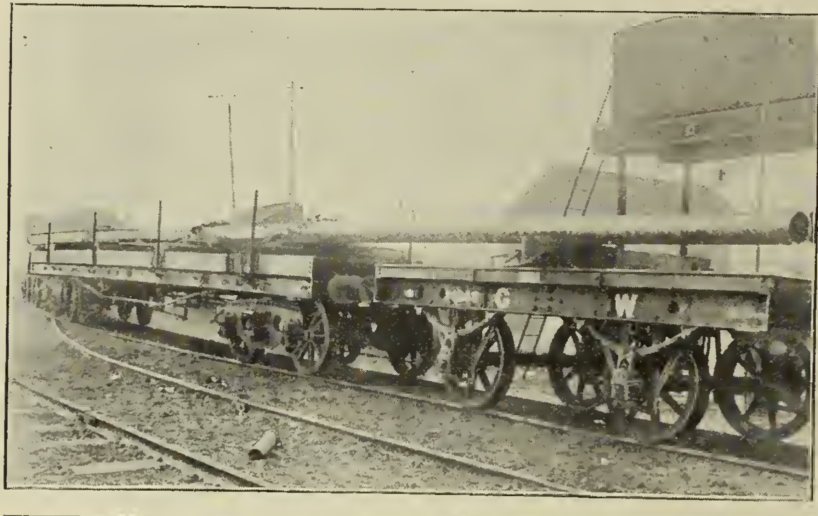

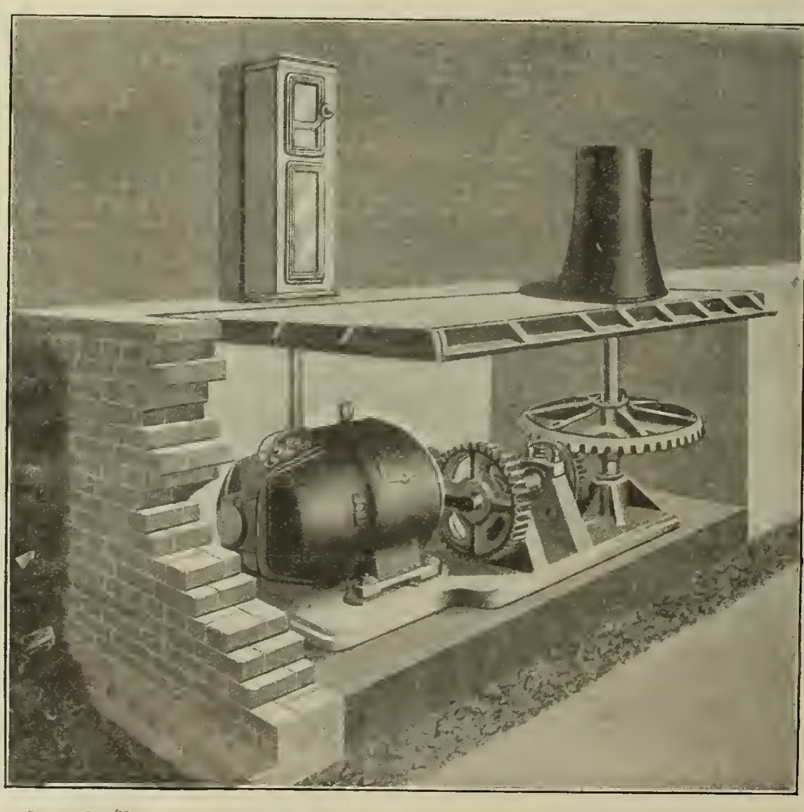

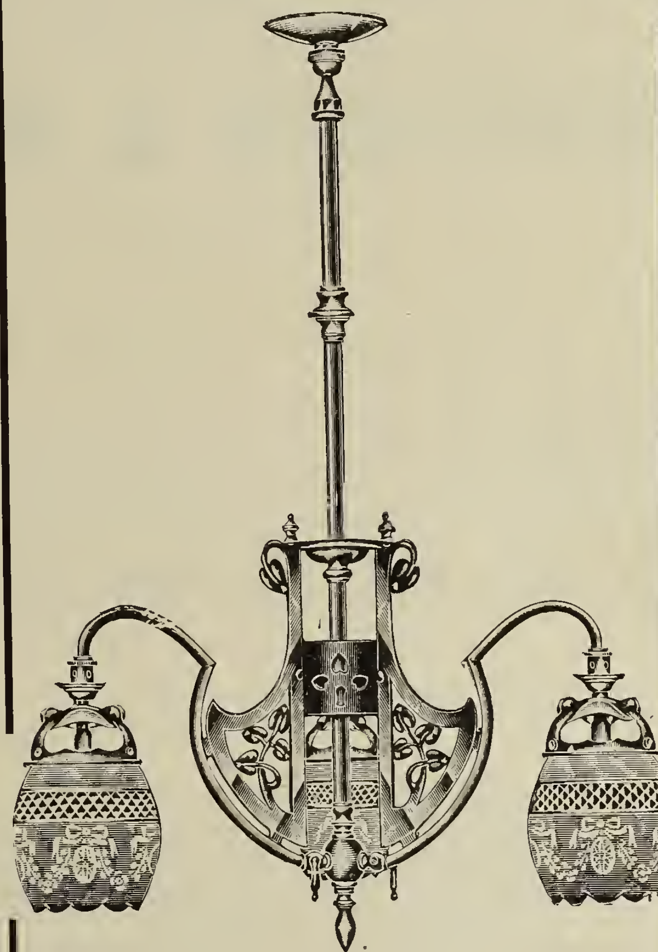

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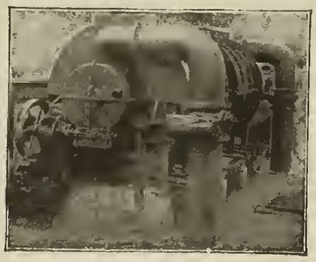

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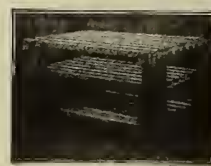

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CONTENTS.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVII., No. 2411.——TUESDAY, JULY 27, 1909.

EDITORIAL NOTES—GAS, &c.

The Distribution Department.

'HE distribution department of a gas undertaking supplies ırge scope for intelligence and ingenuity, and opportuni-ies for satiating the appetite for real hard work of those rho are appointed to the position of responsible heads of uch departments. Things are not as they were in the lden days when lighting, of a character that may be re-arded to-day as being of a more or less primitive order, ormed the major part of the business of a gas undertaking, nd when a maximum pressure of 10-10ths from sunset to iidnight, and 6-10ths for the remainder of the twenty-our hours, regardless of weather, would satisfy both par-amentary and practical requirement. The engineer in iose days of even a fairly large undertaking had no par-icular need for a specially trained man to look after the ffairs of the outdoor department; any intelligent subordi-ate who knew his main laying and service work well, nd could control men, fully met the claims of the time. 'hat has all changed now in towns boasting any im-ortance. The amount of responsibility that has accumu-ated round him, the multitude of the general details of man-gement that require his personal supervision, have very argely confined the engineer to works and office; and in the nterests of the undertaking generally, with the expansion of he demands of the distribution department, it has been neces-ary to transfer the responsibility of the outdoor work to an fficial who is a competent engineer, a man of commerce, and diplomatist. The distribution department offers ample pportunities for the exercise of abilities and for varied nd distinguished service; but the department now requires or its chief official a man technically trained in everything rom the gas-works governors to the question of illumination neasurement, heating, cooking, and power efficiencies, and he merits and demerits of rivals. In fine, the department ieeds a specialist at its head. It is a pleasure to see the ecognition, by the increasing number of young men who repare themselves for the City and Guilds of London Gas-Supply Examinations, of the opportunities that the distribu-ion department of a prosperous gas undertaking offers for echnically trained officials; and those young men, it may e said here, owe much to the first Examiner in this section Mr. J. H. Brearley) for his personal interest in making these ests of qualification, and the diplomas to be gained, so im-mediately attractive and valuable.

However, the mutations witnessed in the distribution de-partment in the past quarter of a century have created a new, responsible, and dignified official position in connection with a gas undertaking—a position that comprises the public safety, the constancy of a public necessity, the contentment of the consumers, and the commercial welfare of the under-taking concerned. In the technical work of distribution, empiricism will not suit the day. The increasing network of mains, the variable drafts upon those mains, the diverse levels and pressures to be dealt with, the unexpected disaster, the precipitation into a situation that looks threaten-ingly uncompromising—all need the man of iron nerve and skill, the man of quick and comprehensive perception, and the man competent in execution. The uses of gas to-day, too, present such a wide range of application that a liberal know-ledge, current to the very day, is essential if a man is to be worthy of his position as head of the distribution depart-ment, and the results of his work are to be worthy the trust reposed in him by his appointment. Change has created the need for such officials; and it is for men to thoroughly qualify themselves for these positions, and for Directors and Gas Committees to encourage these qualified officers to put for-ward the very best that is in them when dealing with the intricate conditions—both technical and commercial—that are with us to-day.

The premature retirement of Mr. G. F. L. Foulger from the distinguished position of Chief Distributing Engineer of the Gaslight and Coke Company (through a cause which has brought him much sympathy from those with whom he has been officially associated in the past, and from a large circle of other friends in the gas industry) has enabled us to give an outline sketch of incidents in his career, which sketch also illustrates how largely the work involved in gas distribu-tion has changed during the last quarter-of-a-century. It may, in passing, be said that, in his youth, Mr. Foulger had not the extensive groundwork of technical training that is considered essential to-day for the man who is going to take charge of the gas from the holders, and distribute and sell it. The conditions and the character of work existing to-day did not obtain then. It must be borne in mind that he started his training nearly fifty years ago, when practically the entire gas consumption took place in the evening, and the almost sole use was that simple one of burning gas at a flat-flame burner for illuminating purposes. And he witnessed the procession of changes one by one, and took part in dealing with the gradual growth of the complex condition of things that now represents the distribution system and the business connections of the huge concern known as the Gaslight and Coke Company. Flexibility in adaptation to circumstances, keenly appreciative and inventive, and a masterly aptitude for carrying big work to a successful issue, were character-istics that helped him through. The place that Mr. Foulger attained in the work of distribution, and his accumulation of experience, mark the spot to which the student aspiring to the chieftainship of a distribution department of an im-portant works must bring his knowledge. In other words, the accumulated knowledge of a working lifetime—know-ledge collected and stored as change succeeded change—must be possessed to-day by the aspirant before he is fully qualified for such a position as chief distributing officer in a gas undertaking of standing. True, much of the distribu-tion experience is unique in the Gaslight and Coke Com-pany's district; much of it is common to all gas concerns. But the man whose knowledge extends to the unique work is better equipped for all emergencies than one whose know-ledge falls short of it.

The two articles that we have published sketching ex-periences in the professional work of Mr. Foulger in the area of the Gaslight and Coke Company will, it is believed, be helpful to the gas-distribution student. They show how the complex distribution system of the Company has been built up by amalgamations, by the excision of in-town manufacturing stations, by the extension of high-pressure mains, by the numerous intersections of main distribution arteries by subways for train, tram, and passenger traffic, and the necessity for laying new mains and connecting up with the ends of the old ones, and by the low sunk tubes for electrical traffic, to which tubes gas has to be conveyed for signal use, necessitating its descent to a depth of (in one case) 123 feet from the surface. Then it is seen how the need has come about for still higher pressures by the adoption of the incandescent burner, gas cookers, fires, engines, and industrial gas appliances, as well as through the greater and unpremeditated draft upon the older pipes by the common adoption in neighbourhoods of the prepay-ment meter system. All this change enjoins the greatest care in following the pulsations of demand in various localities. The position in no feature has likeness with that of (say) thirty years ago. But though the responsibilities of the chief of any gas distribution department has increased in this manner, the very changes that have produced the heavier responsibility have had the further effect of pro-ducing economies in the working of the whole undertaking, though there are Directors and Committeemen who do not look upon, or speak of, the growing expenditure in the dis-tribution department with exactly benevolent feelings. We, however, have the apparently anomalous condition of things that, though the gas business has increased during the last

twenty years by 100 per cent., and is still increasing, the necessity for works plant and mains has not, taking the country through, advanced in corresponding proportion. The reason for this is that first the vertical incandescent burner and now the inverted burner, together with the competition of electricity for lighting, have pulled down the night peaks of consumption; while cooking, heating, and industrial requirements have been at work levelling-up the day load. In this way, there has been brought about a more profitable use of the whole plant. Herein—though the work and expense of the distribution department have greatly increased—lies economy, and economy of a substantial character, to set against the outgoings on the other side. In all which points are seen the extraordinary change that has come over the work required of, and the business done through, the distribution department of a gas undertaking.

There is another change, and that is the amount of disturbance to which a gas-distributing system is exposed in these days as compared with the past, and which exacts from the distribution engineer the greatest circumspection. It is highly gratifying, under the circumstances, that there are not more accidents than there are; and it is still more gratifying to find that the largest accidents with which gas has been identified in London north of the Thames during the past twenty years have been brought about by external causes. In other words, in these happenings gas has been the victim of the fault and the error of judgment of persons unidentified with its supply. But their very occurrence, and their extraordinary character, have shown the need for the responsible chief of every gas distribution department being thoroughly well equipped, technically as well as commercially. In short, the multifarious duties that are of the experiences and requirement of modern times in gas distribution and sale, demand a varied talent of the highest order.

Irrational Wants.

Without any desire to be offensive, it must be said that the West Ham Corporation seem to have completely lost their heads over the Amalgamation Bill of the Gaslight and Coke Company. There is no question that in this matter the Council have allowed their action to be swayed too much by the socialistic section, with the result that all through the piece, or at any rate in the House of Commons and in the House of Lords Committee, they have been told that their requests have been altogether irrational. Representatives of classes or factions are always the most difficult of people to conciliate or deal with. They live unto themselves and for themselves, without any consideration for others. Theirs is a policy of selfishness, and nothing more. That is what is found in connection with the opposition of West Ham to the Gaslight and Coke Company's Bill. We do not for a single moment believe, although there may be some protestations to the contrary, that the West Ham Council did not see public advantage in the amalgamation of the Gaslight and Coke Company and the West Ham Gas Company. If they did not, then business ability and appreciation of business economics run low in the West Ham Town Council. But we do believe that the persistent opposition to the uttermost end was solely to capture as much as possible, and for as long as possible, for the coffers of the Corporation, and—as a secondary matter, and a sop to the Socialistic Cerberus—to ensure the continuation of the employment of the West Ham gas-workers. The whole attitude of the opposition was founded on selfishness, and nothing else, with total want of consideration for the interests of others.

Nevertheless, the Corporation have the assurance of the Governor of the Gaslight and Coke Company (Mr. Corbet Woodall) that they desire to enter upon the management of the gas-supply affairs in the West Ham Company's area on terms of peace and good feeling with the Corporation. But it was impossible for them to accept, at the instigation of the Corporation, conditions that would make that management intolerable—aye and well-nigh advantageously impossible—by the imposition upon them of unprecedented restrictions. Such conditions would have been entirely hostile to the true interests of the public. The three chief wants of the Corporation were, that the period for the continuation of the West Ham works (the Gaslight and Coke Company being already under agreement to maintain them for ten years in operation substantially to the same extent as before the promotion of the Bill) should be extended to twenty years; that the workmen and staff should also be retained throughout a like period practically to the same extent as before the promotion of the Bill; and that the condition should attach that, at the end of the prescribed period, the same conditions should apply, unless the Corporation consented to a change, with appeal to the Board of Trade if consent was withheld. The Corporation wanted too much; and they were aiming at creating a condition of things that would have been a constant source of unpleasantness. The unreasonableness of their wants was too much for consumption by intelligent men such as Lord Clifford of Chudleigh and his colleagues. Parliament has been guilty of a fair amount of shackling of enterprise in the past, but it was never guilty of enforcing monstrous proposals like those that emanated from West Ham. The Corporation overlooked—designedly, no doubt—the main object of a gas company. It is to supply gas at the cheapest possible rate. All else is subsidiary. The parliamentary powers under which a company's operations are conducted are framed to ensure that the gas-works shall be carried on to the best advantage for the consumer, with protection of, and reward for, the capital provided by those who furnish the supply. A gas undertaking is not promoted primarily for rating purposes; nor does Parliament make it obligatory that they shall employ so much labour, nor, in fact, does Parliament make it conditional to the granting of statutory powers that a company shall employ labour at all. It is part of the company's duty to choose, as far as possible in the interests of the concern and of the consumers, between manual labour and mechanical operation. Both rating and labour are merely incidental to the main purposes of an undertaking of the kind. But West Ham could not, or would not, see this; and they wanted to make these subsidiary conditions superior to all other considerations. While, however, the Corporation were so anxious about the rates and about labour, it did not occur to them to inform their Lordships that their own electricity undertaking paid the magnificent sum of £114 in rates last year; and that, in proportion to the business done their own electricity undertaking employs less labour than the gas undertaking. Thus, for all business diverted from gas to electricity, the demand for labour is reduced. We submit the point to the notice of Mr. William Thorne and his colleagues.

The whole question amounts to this, Is the amalgamation of the Gaslight and Coke and West Ham Companies in the interests of those whom a gas undertaking is primarily established to serve? Parliament has answered this question, without in any way qualifying it, in the affirmative; and, the more one looks at it, the scheme commends itself as a statesmanlike proposition, and shows that the economical benefits are equitably scattered. The Corporation, however, made pretence by their action that they were occupying places in topsy-turveydom, and so saw everything from a contrary point of view to other people. Though wanting to serve the local exchequer and labour, the Corporation declared that they were entirely opposed to the Bill, owing to the desire to do the best they could to preserve as cheap, efficient, and satisfactory a supply of gas as possible within their district. It seems to us that their desire to wreck the measure indicated that the preservation of a cheap and efficient supply of gas was of small importance to them, and that the main and selfish purpose was the real propelling force in their antagonism. Really the experience that Mr. Freeman, K.C., has had in connection with Gas Bills, and in the trend of recent gas legislation, ought to have saved him from the ridicule that his dictum exposes him to, that the primary interest of the Gaslight and Coke Company was to do the best they could for the shareholders, and only incidentally for the consumers. The surprising thing was that—extremely silly though it be—the statement was reiterated during the proceedings, with variations in phrase. There is no doubt that, under the new conditions of working in the Gaslight and Coke Company—statutory, administrative, and economical—consumers in the enlarged district will be beneficiaries to a greater extent than they would be by the maintenance of the *status quo*, and in the ratio of $5\frac{1}{2}$ to 1 for the stockholders. The consumers will derive early benefit; the public authorities and ratepayers an almost immediate one through the lower price charged for the public lamps; and the gas workers of West Ham will, we take it, come into the enjoyment of participation in the pension and co-partnership schemes of the larger Company. The river facilities of the Gaslight and Coke Company, the relaxation of the illuminating power standard by 2 candles, and the giving of gradual employment to idle works and capital, will all have beneficial effect over the supply in the larger area. The Lords Committee failed to see that any public damage would

:crue from the Bill; and we are with them. It will be ɜneficial, and not to the contrary. And the West Ham orporation, though sore for a time that their selfish desires ere not pandered to by Parliament, will find, and possibly ıve the graciousness to confess hereafter, that all is well.

Sulphate Production and Demand.

HE Sulphate of Ammonia Committee have completed their velfth year's work; and, as will be seen from the report to :e subscribing members, as published in another column, ıe twelvemonth has witnessed a steadfast application to ıe propagating duties the Committee voluntarily under-.ke, in the interests of their own concerns and those of their llow subscribers. A round dozen years of work induces trospect; and it must be said that the glance back attests ınsiderable success from the efforts of the Committee. /hen the Committee started work in the year 1897, the ɔme consumption of sulphate of ammonia was about ;,000 tons; it had increased to somewhere about double ıat quantity in 1908. The average prices rose from about 7 18s. in 1897 to £12 10s. in 1905, from which level it ıs gradually declined, and now the average stands at (say) 11 7s. 6d. This is a case in which success of operations ust not be entirely judged by price, but rather by sales in ew of the rapidly increasing production and the growing ıd keen competition. A very few figures produce the con-·mation. The total home production was 198,000 tons in 397, and 325,000 tons in 1908, or upwards of 64 per cent. crease in the twelve years. The German output has been creasing at a far greater rate—rising from 135,000 tons 1902 to 300,000 tons in 1908. The total world's pro-ıction exceeds 800,000 tons. This huge increase is chiefly ıe (more particularly in Germany) to the recovery of bye-·oducts in the coke-oven industry; and the production om that source alone in this country has risen from 2000 to ɔoo tons in 1897 to about 64,000 tons in 1908. But it is grati-·ing to be able to state that the great majority of coke-oven ·oprietors in this country recognize their common interest ith gas-works producers, and the importance of the Com-ittee's work, and so have extended to the latter a large ıeasure of support.

The quoted figures are significant, and so is the com-ɜtition of other nitrogenous manures, which latter gathers rce by the growth of the production of sulphate of am-onia and by the threatened invasion of the market by fresh ımpetitors. Activity must be met by activity, and a com-·ehensive appreciation of the position—present and pro-ıective. In a matter of this kind, it is better to over-rate ıan to under-rate. Not only must everything be done to eate local demand, and to see that local requirements are :omptly met, but the field of demand both at home and ɜyond the seas has to be broadened; and this can only be ıne by the diffusion of information. It is with unfeigned easure that we see the supplementing of support to the ommittee by the enrolment in the past year of 23 new ıbscribers, with an estimated aggregate production of 500 tons. The total membership now numbers 330 makers; ıd the subscriptions last year represented a tonnage of ɔ2,138, or an increase of 19,341 tons. But this means that ıere is still a considerable tonnage of the home production ithout representation on the Committee. Is it necessary ter the figures already cited, is it necessary with the ıarked signs of an expanding competition, to enforce by ırther words the importance of a complete support being :corded the Committee by makers of sulphate of ammonia, ıd not only by makers of sulphate of ammonia, but by ·ery gas undertaking? For whether or not gas undertakings :e makers of sulphate of ammonia, the price of ammoniacal quor is largely governed by that of the product yielded y the liquor. In addition to the necessity for the creation fresh demand to meet increasing production, the fact ıat, at the present price of nitrate of soda, sulphate of mmonia should be standing somewhere in the neighbour-ɔod of £15 per ton, emphasizes that there is much work › be done, and that without intermission. The pecuniary ıd moral support of all interested in sulphate of ammonia ıd ammoniacal liquor will greatly assist and encourage the ommittee in their labours.

The Committee are keeping well up in activity to the pportunities vouchsafed them by their supporters; but a ɜry striking aspect of their work during the past year has ɜen the competitions carried out by the Scottish Agricultural ocieties. Results from the employment of sulphate of ammonia such as those presented at the end of our reprint of the report of the Committee cannot be lost upon the farmers engaged in the competitions, and must have perennial influence with them and their neighbours. We ask readers to particularly study the increased weights of various crops from land treated with from 1 cwt. to 1½ cwt. of sulphate of ammonia per acre, as compared with untreated land; and they cannot but agree as to the educational value of these figures. This is only one of the directions—but it is an exceedingly important one—in which the Committee are prosecuting their work; and such convincing demonstrations ought, as quickly as possible, to be carried to the furthest extent. It should be remembered that the amount of support extended to the Committee sets the limit to the vigour of their campaign.

Heating and Ventilation.

THERE was a paper read, at a recent meeting of the Surveyors' Institution, by Mr. E. H. Blake, on the subject of "Warming and Ventilation;" and, after perusing the communication, we find good reasons for sharing the regret that was expressed by the Council of the Society of British Gas Industries, in their last annual report, that negotiations for a conference with architects on the subject of the heating of buildings by gas had not been brought to a successful issue, inasmuch as it was thought that many matters might be considered generally by the architectural and gas engineering societies which would be of mutual advantage to all concerned. Though the negotiations have so far been abortive, it is to be hoped that—particularly after this paper by Mr. Blake—there will be a further endeavour to bring about a mutual discussion of the question, upon which some hazy notions seem to exist in the architectural mind. The paper before us is extremely interesting as being, in considerable part, a compilation and digest of scattered published information, with, in one or two respects, testimony to the persistence of erroneous notions, which by reiteration have by some come to be accepted as truths.

It is not a confession of which an architect can be proud, that though much has been done to increase our appreciation of sanitary construction, buildings almost as ill-planned and ill-ventilated as those of 200 or 300 years ago are still to be found. It is notorious that both the Law Courts and the new Central Criminal Court are not all they should be in respect of ventilation; and, though in both electric light is employed, complaint of the speedy stuffiness of the atmosphere has been very pronounced. With so many ill-planned and ill-ventilated buildings in existence, it follows that, wherever possible, the systems of lighting and heating them should be of a kind that will assist in improving the conditions of the atmosphere by creating its free circulation. The science of ventilation, as Mr. Blake points out, is closely allied with that of warming; and the two processes are often combined. And we claim that with gas, by the exercise of a little common sense, there is offered one of the simplest of methods of combining warming and ventilation. There does not, however, appear to be one of the systems of heating brought forward in the paper that meets with the author's unqualified approval. They are all unfortunate enough to have their disadvantages in some form or other. Gas-fires do not escape the general criticism. They are generally, says Mr. Blake, considered to be unsatisfactory, though many improvements have been made in them in recent years. "They are apt to cause a want of humidity in the "air, or, at any rate, to produce a parched feeling in the "throat." This is rather a sweeping condemnation, which is effectually disposed of by the growth in favour of the modern types of fires, and by their recommendation by medical men, though it is admitted, and frankly, that we look for still further improvement. If Mr. Blake has had personal experience of gas-fires at all, it has not, we venture to assert, been with one of the modern types. From these have been deposed many of the acknowledged defects of the primitive types; by simple means, securing perfect combustion, efficiency has been largely enhanced; and they are now under proper control, given a chimney with a fair updraught.

The ordinary gas-fire has an advantage from the point of view of ventilation, in that it is an open fire; and this an electric radiatior cannot profess to be. "A close stove," remarks Mr. Blake, "cannot be looked upon as an aid to ven-"tilation such as is afforded by an open fire." He admits the expensiveness of electricity as a means of warming, but refers to electric radiators as being "more sanitary, and

"under perfect control." How can the electric radiator be characterized as more sanitary than the open fire, seeing that it is not an "aid to ventilation" as is the latter? And later on it is stated that apartments with a large cubic space per head and slow change of air are less healthy than those with less space and more frequent change. On these grounds, the modern gas-fire assisting in the ventilation of a room, and in producing a free circulation of the air, must, altogether apart from its superior efficiency as a heating agent, be more "sanitary" than the electric radiator, which does little, if anything, in creating a change of atmosphere, but decidedly favours stagnation. Among the essentials set forth in the paper for a satisfactory method of ventilation and warming is that a change of air must be thorough, and no stagnant corners must be left. That is where electric lighting and heating fail to render any assistance in maintaining the atmosphere of apartments in a sanitary condition.

There is another venerable erroneous notion lurking in Mr. Blake's mind, which notion has been knocked on the head by recent scientific research. He remarks that, in calculating the quantity of air required, each gas-jet or candle can be regarded as equal to one human being in its effect on the purity of the air. But in another place we are told that, while a gas-jet assists upward ventilation, it is difficult to deal with in downward systems of ventilation. From Mr. Blake's own submissions, it is seen that the extracting and inductive power of the gas-fire in the lower part of a room, and the assistance rendered by the gas-jet in upward ventilation, will, with the adoption of the most simple means, and not the elaborate ones required for causing free circulation of the air in an electrically lighted and heated apartment, cause a constant change of the atmosphere, and keep the apartment in a sanitary condition. As to the point regarding a gas-jet or candle being equal to one human being, we put forward no excuse for again directing attention to the researches of Herr W. Weichardt, as published in the "Archiv für Hygiene." This investigator found in the air exhaled from the respiratory organs of human beings a high molecular poisonous product of albuminous origin, of the character of a toxin. In this is the explanation of Pettenkofer's observation that pure carbonic acid is far less injurious than the carbonic acid derived from respiration. Pettenkofer found that pure carbonic acid in the proportion of 100 parts per 10,000 parts of air was not injurious to human beings, while 10 parts of carbonic acid per 10,000, if derived from the respiration or perspiration of human beings, rendered the air unfit for a person to remain in it for any length of time. In view of this, several modern incandescent gas-burners can be used before the equivalent is reached to one human being, and not one gas-jet as suggested by Mr. Blake; and then the vitiation of the air by the human being will be of a worse order than that of the incandescent gas-burner. Herr Weichardt also shows that gas-flames actually have a purifying influence, which electric lamps and radiators have not, on the atmosphere of rooms, by reason of their free combustion acting destructively on the organic products of respiration. But these are matters that are dealt with at greater length in an editorial article in the "Journal" for Feb. 9.

We see that recently the "Electrical Review" was trying to demolish the views of Professor Vivian B. Lewes on this matter by the aid of a few commonplaces and the quotation of an antiquated statement as to the air-vitiating property of burning gas. But the question is a far larger one than our contemporary's manifestly narrow studies apparently enables it to comprehend. It suggests, however, as a remedy for bad ventilation, the use of an electric fan. Where electric light is employed, we admit this auxiliary is needful. But to the ordinary householder, the installation and the running of an electric fan means expense, and is a tax upon him for using such an already expensive illuminant as electricity. In a small apartment, the buzz of an electric fan is an annoyance; and its use, too, in a small apartment should be accompanied by costly electric heating, as, with the open fire, there is the danger of what should go up the chimney being drawn through the room to the disadvantage and the harm of the occupants.

The Livesey Memorial Fund.

A meeting of the Committee of the Livesey Memorial Fund was held last Thursday afternoon at the Offices of the Institution of Gas Engineers, No. 39, Victoria Street, S.W., when the opinion was expressed that there might still be some who wish to subscribe but who have not yet sent in their names. We have much pleasure in complying with the suggestion that we should publish a complete alphabetical list of those who have already subscribed (classified according to the list published in the Council's annual report), and trust that the publication of the full list which appears on pp. 255-258 may have the effect of bringing in further subscriptions. It will be seen that the sum of £10,000 (the minimum required) has now been obtained; but the Committee hope the figure may be increased to £12,000, so that the Professorship may be placed on a thoroughly sound basis.

The City Street Lighting Report.

The electricians are taking the report of the deputation to the Continent and their recommendations very badly, and they are fully prepared to contradict everything that has been said, and everybody who has anything to say, that is adverse to their own views. The "City Press" has had a representative interviewing certain gentlemen connected with the electrical interests concerned in the City; and these gentlemen are very wroth with the Corporation deputation, and parrot-like trot out points that have already been made by electrical contemporaries. But it is on the comparative costs of the high-pressure inverted gas-lamps and flame arcs that they are most severe. It has come as a shock to them that these 1500-candle power inverted gas-lamps can be supplied at as low as £16 0s. 10d. per annum, as they are being supplied to-day, and that, when the Bill of the Gaslight and Coke Company becomes an Act, and is brought into operation the lamps will come down in annual cost to something like £15 2s. 6d. Now our electrical friends say that the price of £17 10s. quoted for the flame arcs in the City is purely an experimental one, and could be materially lowered on a large contract. It should not be overlooked that the price of £17 10s. was originally quoted for not less than 250 lamps, which is a fairly large contract. But the informants of the "City Press" state that they have another way of lowering the cost of street lighting by flame arcs, and that is by reducing the number used in a given length of thoroughfare. How beautifully simple! In some mysterious way they also think that gas is favoured in the City at the expense of electricity. But what of those hundreds of antiquated arc lamps in the City that have been paid for year after year at the price of £26 apiece. The City of London Company from these "ill-gotten gains" (if we may be permitted to use the expression) ought to have put by a heap of money with which to carry war into the enemy's camp. Then we are told by the electrical people that the illuminating power quoted for gas-lamps is purely nominal, but that the power of their own lamps is actual. The facts are contrariwise. If the "City Press" study carefully the statements of the interviewer, it will be seen that the electricity suppliers in the City do not know what is the illuminating power of the flame arc lamps in the City streets. While the City of London Company tabulate the lamps as being of 1500-candle power, the makers put them at 2000-candle power! Which is "actual," and which "nominal" power? Central suspension and trimming at ground level, and superiority in fogs, are claimed to be in favour of electricity. This point was dealt with last week (pp. 160-1).

City of Berlin and Public Gas Lighting.

Our electrical contemporaries, and now the interviewed by the "City Press," make rather a bad mistake when they try to infer that, because the City of Berlin is a gas supplier, it pushes gas under all and any circumstances. Unlike Corporations supplying electricity, who generally charge a high price for current used for public lighting purposes, the City of Berlin takes no credit for the gas used for public lighting, and very seriously diminishes thereby its profit on the undertaking. The cost of production and distribution for public lighting purposes is entered as a working expense, without any corresponding entry on the revenue side. That is one point. Another point is that the Municipality of Berlin draw an extraordinarily large revenue from the electric light undertaking; and so the more current consumed, the more they benefit. A further point is that the Municipality of Berlin are not the only suppliers of gas. The Imperial Continental Gas Association also light a very considerable portion of

3erlin proper, and nearly all the western suburbs. This point vas referred to in our editorial on the report of the deputation in ast week's issue.

'urther Municipal Gas-Works Results.

From a further batch of results of the working of municipal ;as undertakings during the past financial year, noticed in this ınd last week's issues, it will be seen that a satisfactorily larger ɩum has been received from the sale of gas at Ashford. Since 898, when the Council acquired the works, the demand for gas ıas necessitated an increased make of no less than 194·8 per ;ent., which is a fine growth to record within a space of eleven years. The detailed report in connection with Bradford is not ;et published; but it is stated that a loss of about £5000 will be shown—which doubtless reflects the state of trade during the ;ear. At Clitheroe, there is a very fair increase in the quantity of gas sold, and also in the make per ton of coal, which is given ıs 10,666 cubic feet. Mossley also reports a small increase in ;ales, notwithstanding the bad state of trade, particularly in the cotton industry, during the year. A sum of £160 is transferred o the district fund; and £1600 is placed to a suspense account 'or the renewal of trunk mains. An outstanding feature of the Stafford gas accounts is the unaccounted-for gas, which stands at he remarkably small figure of 1·29 per cent. The output of gas shows an increase of about 3 per cent.; while the make was at he rate of 11,412 cubic feet per ton. The Committee recommend :hat a sum of £3000 be transferred to the district fund, and that £50 be granted to the Free Library Committee. A system of profit-sharing is in vogue at Stafford, under which the men working in connection with the Gas and Electricity Departments receive a bonus on the results achieved. There is a satisfactory ncrease in the output of gas at Todmorden, where the make per ton is given as 11,207 cubic feet. An amount of £461 is transferred to the district fund; and some capital outlay during the year (for which it is not intended to raise loans) is charged to the appropriation account to which the net profit is carried. At Warrington, a falling off of about 3 per cent. in the make of gas is ascribed almost entirely to the bad condition of trade. A trifling decrease of just over ½ per cent. in the total make of gas is reported from Wigan, and of ⅓ per cent. in the quantity sold. At the same time, the consumption through slot-meters exhibits an increase of more than 13 per cent. While £9112 was collected from the meters during last year, the loss by cash-boxes being broken open was only £1 13s. 3d. A sum of £3000 is transferred to the district fund; and it is noted that £5402 represents "the value of the gas given to the Streets Committee for the public lighting within the borough."

Progress of the Coal Dispute.

"Peace prospects hopeful" is the latest statement that can be made with regard to the dispute in the Scottish coalfield which has been threatening to bring upon the country's industries a disaster of unparalleled magnitude. As the result of a conference at the Board of Trade between representatives of the masters and men, a Committee was appointed to consider what conditions ought fairly to be attached to the recognition of a new minimum as regards limits and rates of variation above that minimum, and the proceedings by which changes of wages should be regulated. This Committee met on Friday, and ultimately adjourned until to-day, when they will further discuss the matter in Glasgow. The masters would appear to have conceded the priuciple of the minimum wage, which is what the men have been holding out for. Thus the question of the conditions to attach thereto has become the matter for arrangement; and it is a difficulty that, under the circumstances, should not prove insuperable, particularly as the operation of the notices served on the men has been postponed for a week to allow of negotiations being concluded. Meantime, the ballot-papers sent out by the Miners' Federation of Great Britain are being returned; and the results so far published show an overwhelming majority in favour of a national strike, should a Scottish lock-out be declared. It is, of course, possible that this fact is making its influence felt in the ranks of the employers; but that alone, while increasing the prospects of a peaceful settlement of the present trouble, has its serious side. If the threat of a national strike is found to work well on one or two occasions—for the men, at least, are inclined to regard the South Wales settlement also as having been brought about to a large extent through the agency of this threat—it is to be feared that, with future disputes, the temptation will prove irresistible to employ the same means of bringing the coalowners round to the men's way of thinking. If this be so, it can only be said that the danger of a national strike is postponed—not that it is removed. The complete organization of the miners of the British coalfields has undoubtedly placed an immense power in the hands of the men; and we should like to be assured that this power will not be used for the purpose of crippling the industries of the country in a way that could hardly be done by any other means, with the exception perhaps of a successful invasion of England by a foreign army. The possibility of the power being so employed constitutes a menace the seriousness of which does not seem yet to have received the consideration it deserves.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 273.)

The Stock Exchange has had but a dull week on the whole, and the various interesting incidents of this period did not, on balance, make in favour of stimulation in business. The approach of the holiday season, too, was beginning to make itself felt. The opening was sluggish; but the tendency was pretty fair. Consols and the gilt-edged group were harder, and Railways a little brighter. Tuesday was quiet, but mostly steady. Consols advanced, and good returns came in to cheer Railways, which were depressed by coal fears. Wednesday was quiet; the City being *en fête* to welcome the Fleet. Railways were again in a see-saw mood, between the favourable half-yearly figures and the coal outlook; and there was weakness in several markets. On Thursday, business had to give place to further festivity. Consols and the gilt-edged division were weaker; but Railways, clutching at the straw of a Board of Trade conference, were rather firmer. On Friday, business generally was dull and quiet. The more speculative markets were weak; but Railways improved on dividend prospects. A notable incident was the announcement of the great Bank amalgamation. Saturday was very quiet; and the general tendency was lower pretty well all round. In the Money Market, there was an abundant supply at the old, easy rates. Discount terms were steady. Business in the Gas Market was well up to the mark, and movements in quotation continued upward. The Gaslight and Coke Company had two pleasing items of news—viz., the passing of the Amalgamation Bill through the Lords, and the announcement that they could pay the increased statutory dividend with only a trifling reduction in the carry-forward. Dealings in the ordinary stock were brisk at from 104 to 105¼—a rise of ¾. The secured issues were unchanged; the maximum marking 88¼ and 88½, the preference from 105 to 106⅛, and the debenture 85⅞ and 86. South Metropolitan were again quiet and unchanged at from 122 to 123, and the debenture was done at 84½ and 84¾. In Commercials, the 4 per cent. changed hands at 108½ and 109½, and the 3½ per cent. at 105½. Among the Suburban and Provincial group, Bournemouth "B" was done at $17\frac{1}{32}$, Ilford "A" at 142½, and West Ham debenture at 106½. West Ham ordinary rose 2 on the success of the Amalgamation Scheme. Portsea issues advanced, as did Tynemouth and Liverpool in the Provincial Markets. All the Continental Companies were but little dealt in. Imperial furnished a few transactions at from 179 to 180. European fully-paid changed hands at 24½ and 24⅝, and ditto part-paid at 18½. Union was not dealt in; but the preference rose a point. Among undertakings of the remoter world, Bombay was done at $5\frac{13}{16}$, ditto part-paid at 4⅝, Buenos Ayres at from 13⅝ to 13¾, Monte Video at 12⅞, Ottoman at $6\frac{5}{16}$ and 6⅜, Primitiva at 6⅞, ditto preference at from 5⅜ to $5\frac{9}{16}$, River Plate at from 16 to 16⅜, and ditto debenture at 97½.

ELECTRICITY SUPPLY MEMORANDA.

A Suggestion for "The Times"—Universal Satisfaction Impossible—A Drop in Provisional Orders—An Improvement in Figures at West Ham—Lessened Revenue Charges—Power Prices—A Perilous Margin—Consumers must not be Penalized; Ratepayers may be.

We suppose it is perfectly hopeless to suggest to "The Times" that arrangements be made for some "Gas Notes" by an "Engineering Correspondent" other than the one who contributes "Electrical Notes" to the Engineering Supplement. The "Gas Notes" would, or should, afford some good reading, and serve as a counterforce to the extreme prejudice in which are steeped the "Electrical Notes" that are served up to readers of "The Times." This engineering correspondent has been holding forth upon the report of the deputation that the Court of Common Council of the City of London sent to the Continent to investigate the systems of public lighting; and like our electrical contemporaries, he has never heard of gas-lamps being fitted with raising and lowering gear, and so, as he has no knowledge of these things, he thinks that the chances of gas are surely disposed of for street lighting finally and irrevocably. A bit of gratuitous advice is tendered to the Streets Committee by this wise individual, who would like to see the Corporation

hasten into an electrical contract for the City lighting. "It is," he writes, "perfectly useless for the Committee to hope to anticipate invention; and, therefore, the only sensible course is immediately to adopt the best practice of the present day and to make a favourable contract for the lighting of the main and side streets by flame arcs and metal filaments. That a very marked improvement on the present standard of illumination could be thus effected is not disputed; and the total cost per annum would probably be reduced. The City is by no means difficult to light; and it is merely the question of expense that troubles the Committee. But they will not receive much assistance, and they may be grievously misled, by a laborious study of gas pressures, candle power, watts, or even calorific value." What! has this writer of "Electrical Notes" come to the conclusion that all the nocturnal perambulations with illumination photometers, with no two sets of results of the tests corroborating each other, have been labour lost? This same much prejudiced person the other week stated that, "so long as it can be demonstrated that electric lighting by metal lamps is cheaper than gas, it is certain that the raising of the price will no longer carry a risk of driving consumers to revert to gas lighting." "The Times" might have regard for the feelings of those of its readers who are investors in the gas industry, and request this partisan to temper his frothy and stupid declarations with a little mercy.

The Electric Lighting Acts Amendment Bill expects to get home this session, after its many essays. But the measure is not going to give universal satisfaction; for in regard to it electricity supplying companies are opposed to municipalities, electrical contractors to municipalities, and the House of Commons and the Board of Trade to the House of Lords. The Companies are of opinion that the Bill in certain respects unduly favours municipalities to the hurt of private enterprise; the electrical contractors are of opinion that the municipalities ought not to spend money on wiring or fittings except through them; the House of Lords sympathized with this, and amended the Bill, whereupon the contractors rejoiced, and were exceeding glad; the Standing Committee of the Commons who have been considering the Bill have now ruled out the Lords' amendment. The contractors will feel disconsolate, and probably the House of Lords indignant. The Government realize that they may have difficulty over their ruthless excision, but are going to try to negotiate the matter. What line they will take in doing this is in the clouds at present.

The electrical manufacturing industry cannot look upon the new enterprise held out by the Electric Lighting Orders applied for and granted in the past session as brightening their prospects. Since the General Electric Lighting Act, 1889, was passed, there has never been such a poor show of applications for Orders. The total amounted to the unlucky number of thirteen—six by local authorities, and seven by companies; but the Board of Trade only gave their consent to nine in whole and to two partially. One of the two rejections was on account of the Board not being satisfied with the financial arrangements; and the other followed the report of the Inspector who conducted an inquiry—the Order being opposed. Since the last report on applications, there have been a dozen transfers of Orders—in all but one case from local authorities to companies. Prior to this session, 1058 Electric Lighting Orders were confirmed by Parliament; but 283 of these have been revoked or have expired.

A peculiar report is that with which Mr. A. Hugh Seabrook prefaces the accounts of the last year in which he shoulders the duties and responsibilities of the engineership and management of the Electricity Department of the West Ham Corporation. Appreciation must be expressed of the kindness of some unknown friend who has sent us a copy of this entertaining document, which is a skilful piece of special pleading, and an able exhibition of sophistry in defending the West Ham electrical policy of the past. That policy has been the subject of animadversion of varied character; and this final report is intended to confound all who have been in any way engaged upon the opposing criticism. A credit balance of £3854 is shown on the accounts on this occasion; and so there has been an apparent improvement in the results of working to the extent of £8500, seeing that there was a deficiency of £4669 in the previous year, which the rates have had to bear. These facts have been shouted from the house tops of West Ham. There are two notable items in the revenue—the reduction in the receipts from private lighting from £23,996 to £22,784, and an increase in revenue from power to the extent of nearly £8200. Now Mr. Seabrook (the words being printed italics, which express a challenge) says it is a difficult matter to explain away the improvement in the department of £8500; and he asserts that he is perfectly certain that, in view of the impossibility, owing to the metallic filament lamps, of rapidly increasing the lighting business, the position of the undertaking would be most serious if it had not had the benefit of the large increased business in power. After all that has been heard from West Ham about the cost of electric lighting being lower than incandescent gas lighting, it is strange that Mr. Seabrook should take such a pessimistic view of the future slow growth of the lighting business; but, at any rate, his admission discloses that the people of West Ham accept at their proper value the loud pratings and unsubstantiated assertions of the Sales Department of the electricity concern. It is, however, good to find Mr. Seabrook taking an intelligent view of the actual position of one part of the affairs of the undertaking.

Upon the credit balance of £3854, and upon the increase in the receipts for power (for it is to the power department that Mr. Seabrook attributes the "improved" position of the concern), observation has to be made. Mr. Seabrook seems to be hurt that there should be people "who have the effrontery to say that the prices at which power units are supplied are unremunerative." It seems to us that Mr. Seabrook's own accounts show that it is so; for it is not entirely owing to the increase in the power business that there is a balance on this occasion, and it is quite easy to demonstrate that the balance stands perilously near a dangerous brink over which it may easily tumble. The fact that there has been an improvement in the revenue of £8500 does not provide the justification for the power prices, nor does the balance of £3854. If the items of revenue are scrutinized, and compared with the previous year, there are found increases that will total to upwards of £3400 to set against the improved revenue; one of the items, £1020, representing coal, which no doubt was obtained at a lower price per ton than in the preceding year. On the other hand, there have been eliminations from expenditure on revenue account and decreased charges in respect of certain items, without noting the minor changes, that (after deducting an item of £296 "works executed for consumers, &c.") make up a sum of £3100. For instance, although a greater amount of power business and work has been done, and more machinery has been in use, we see that £266 less has been charged for oil, waste, water, and engine-room stores, £294 less for the repair of buildings, and £682 less for the repair of machinery. An item of £186 has been knocked out that appeared the previous year as distribution wages. Repairs and maintenance of mains have cost less by £219, and of services £80 less. There was an amount of £37 for free wiring included a year ago; but nothing of a corresponding nature is in the present revenue account. Although many more motors have been brought into use, their repair and maintenance (including depreciation) has gone down by £481. Public lamp wages are less by £195; and carbons, globes, &c., have diminished by £67. Only £114 is now charged for rates and taxes, which is less by £62 than before. The item of printing, stationery, and advertising has been reduced by £290; and there have been eliminated £551 for publicity expenses, "Bulletin," &c. We suppose that against the eliminations of £186 for distribution wages, £37 for free-wiring installations, and £551 for publicity, has to be set the item of £296 for work connected with the consumers. But it must be said that it is very considerate of the buildings, machinery, mains, services, and motors, all to have required so much less repair and maintenance in this one year when Mr. Seabrook's lower power charges and the Committee's policy have been so keenly criticized. It is also noticed in a table headed capital expenditure and amount repaid that the "capital repaid and in sinking fund" stood, at March 31 last, at £93,599—an increase in the twelve months of £15,501. In the two previous years, the increases were in each £26,328. For which various reasons, it is not difficult to show that, if certain items in the accounts had not stood at a lower amount, and if certain other items had not been completely erased, Mr. Seabrook's balance of £3854 would have been completely lost; and that it is a sum upon which no reliance can be placed in the future, when coal is dearer, when items of repairs and maintenance are heavier, and when there is proper assessment of the undertaking, which will alter the character of the ridiculous charge for rates and taxes of only £114.

In considering whether the prices charged under contract for power units are too low, regard must be had to the worst possible conditions that may obtain during the period of contract. Rates and taxes are to be increased, coal may go up again, and repairs and depreciation may require much larger sums than those charged last year. Whatever may happen contract prices go on serenely indifferent to the altered conditions. The average price for power obtained last year was 0·591d. per unit; but Mr. Seabrook shows that the average cost per unit is 0·52d.; and the average capital charges come to 0·457d. per unit—making together 0·977d. But the department, on Mr. Seabrook's advice, are supplying a certain electricity consumer at 0·37d. per unit! The justification for this is not yet forthcoming. With the income from the dearer priced units falling off, with such an average expense of 0·977d. per unit, Mr. Seabrook (light-hearted as he would appear to be over the matter) must realize that there is real danger in the position. Over the whole of the output, the average income was only 1·02d. per unit last year; and so, the average outlay being 0·977d., there is only the small margin of 0·043d. per unit. This does not appeal to us as prudent finance. Seeing that the whole of the 8,190,453 units sold for power are supplied at an average of 0·591d., the average margin of 0·043d. is not supplied by the power consumers; but it is their business that will tend to decrease it, notwithstanding all that Mr. Seabrook claims for the trade in power, which claims do not, on an examination of the accounts before us, appear to have a very sure foundation. Before leaving this point, it is of interest to notice that for public lighting the ratepayers paid £6557 for 785,185 units, the private consumers £22,784 for 1,928,528 units, the power users only £20,610 for 8,190,453 units (more than £2000 less for more than four times the current), and the tramways £19,179 for 4,617,927 units (or only about £1400 less than the power users for something like half the quantity of electricity).

There is just one point in which we are in agreement with Mr. Seabrook. "The undertaking," he says, "is distinctly run for the benefit of its consumers; and the latter should not be penalized in order to make large profits." While in agreement with this, there would also have been hearty endorsement if Mr. Seabrook had gone further, and said "nor ought the ratepayers

to be penalized for the benefit of the electricity consumers." The ratepayers have been very heavily penalized on behalf of Mr. Seabrook's patrons. We see that for the year ending March, 1908, the deficiency that had to be provided out of the rates was £4669; and we understand, from the Local Government Board inquiries that have been held, that on account of the undertaking £25,863 in hard cash has been taken from the ratepayers' pockets. This would not have happened had the concern been in the hands of a company. This indebtedness of the electricity consumers to the ratepayers ought to be discharged as early as possible. While there is no desire to see consumers penalized, Mr. Seabrook ought to be equally solicitous for justice to the ratepayers. There is another way in which the ratepayers have been penalized. The amount charged as rates and taxes last year is only £114. The concern has never been properly assessed; and the ratepayers have been penalized in consequence to the amount that the concern ought to have paid in rates, but has not paid. The fact of the matter is, Mr. Seabrook's report wants much revising, in order to eliminate that which is fallacious, in order to supply the omissions in pointing to the causes contributing to what he chooses to regard as a surplus, and to put in a plea for the fair treatment of the ratepayers by discontinuing the policy of penalizing them for the benefit of the electricity consumers.

INCIDENTS IN A LONDON GAS-DISTRIBUTING ENGINEER'S CAREER.

(*Concluded from p.* 168.)

Some Historical Mishaps.

Here we have a Company supplying gas in an area of 62 square miles, through which run 2200 miles of main gas-pipes, ranging from 48 inches down to 3 inches, and conveying gas at high and low pressures; and in this district connected to these mains at the present time are consumers to the number of not far short of 600,000. In respect of the extent and value of property, and of density and number of population, there is not another gas-supply district the equal of the Gaslight and Coke Company. Over the surface of the streets in which are these 2200 miles of mains, and the (but a few thousand short of) 600,000 gas service-pipes, not including those to public lamps, there is more traffic than in any other gas company's area. There is an occupation of the subsoil of the streets to an extent that is unequalled elsewhere; and it is the district that contains more tunnelling than any other for electric trains, for foot passengers, and for the accommodation of the means of public service. With such variety of conditions —mostly adverse to soundness of distribution system—would it be wondered at if there were frequent troubles? But they are not so frequent as might be imagined; and there is no doubt this is owing to the splendid organization and systematic operations of the Company's distribution department. There are minor occurrences that are insufficient to attract public attention; but in connection with the rare larger ones, they have been, as a general rule, due to some foreign cause over which the Company have had no control whatever. This fact, though disaster is always to be deplored, is very satisfactory.

It would have been a remarkable period of peace for the Chief Distributing Engineer in the past twenty years, if he had not had some extraordinary occurrences to deal with, requiring skill, courage, and presence of mind. The two salient ones associated with Mr. Foulger's career require no effort to call them, nor in the main the details, to mind. There was the notorious mishap of Sept. 15, 1890, at the Vine Street Bridge in the Farringdon Road. It illustrated a terribly big effect from a small cause. The Metropolitan Railway Company, unknown to the Gas Company, had a naphtha store immediately under the bridge; and this bridge carried two large trunk mains from Beckton to the West-end of London. One of these mains was a rectangular wrought-iron tube, the equivalent of a 48-inch circular gas-main. The other was a rectangular tube, the equivalent of a 36-inch main. In the early hours of the memorable day in September, 1890, the watchman in charge of the naphtha stores fancied a smoke. He little knew what that fancy was going to cost in the way of local mischief, and trouble to the West-end of London. Immediately the man lit his pipe, the whole place burst into flames. No less than thirty barrels of naphtha, each containing 30 gallons, exploded and fired. The fierceness of the fire softened the wrought-iron girders of the bridge; and the result was that the two large rectangular gas tubes—the 48 and 36 inch—were drawn from the mouthpieces of the circular cast-iron mains with which they were joined up on either side of the bridge. In an instant the gas was burning furiously at each end. This was the task to which Mr. Foulger and his staff were suddenly called. The road was opened up on either side of the bridge, and the mains bared. Holes were cut into the mains; and two bags were inserted in each. But this was insufficient to extinguish the burning gas. The next step was to open the hydrants, and waterlog the space between the bags each end. This took some thirteen hours to accomplish; and the mains were then effectually capped back. But a concurrent difficulty was that the West-end of London was practically without gas, excepting to the amount contained in the holders westward. To promptly meet this trouble, a temporary 48-inch main was laid across the damaged bridge. This was successfully accomplished within two days; and then, and not till then, was there relief from anxiety. The repair of the mischief wrought by that watchman's desire for a smoke in contiguity with 900 gallons of naphtha was then comparatively plain sailing.

A more recent notable accident was the great gas fire on Jan. 13, 1904, in Piccadilly, which was also produced by a circumstance quite external to the operations of the Gas Company. In this instance, an excavation had been made for the basement of the Ritz Hotel, to the depth of about 50 feet; and a temporary retaining-wall had been built for the purpose of maintaining the roadway in position. A large travelling crane was at work; and early on the morning of the day named, this collapsed—the jib of the crane in falling breaking away the temporary retaining wall, with the result that the adjoining footpath, and about one-third of the roadway tumbled into the basement excavation. In consequence of the road giving way, the gas-mains were broken; and the gas belching forth from the open ends of the broken mains was fired—whether through the fusion of wires, or the fire in the boiler supplying the steam for the driving of the crane, was never positively ascertained. At first the larger mains were not broken; but the Fire-Brigade in pumping water and throwing it into the flame-filled chasm unquestionably contributed to further silting away, causing the larger mains in the centre of the roadway to be relieved of their support; and they too collapsed and the gas caught fire at the broken ends. The result was that the flames were being fed by mains which were passing gas at considerably over ½ million cubic feet per hour. There were in all four mains broken—an 18-inch, a 12-inch, a 6-inch, and a 4-inch; and almost for the width of the opening in the road, the mains broke away, and fell to the bottom of the huge hole, leaving eight open ends from which the gas issued, and flamed. The trouble was successfully remedied in three hours without the slightest injury to person or property, and without interruption of the supply. We think it may be truly said that no one before or since has had to tackle such a condition of things as that to which Mr. Foulger and a staff of the Company's Distribution Department were summoned on the morning of Jan. 13, 1904.

We may here quote from some remarks made in the "Journal" a few days after the event:

> The immense volume of flame almost filled the gaping pit, and rose some 20 to 30 feet in the air, with small clouds of escaping gas floating away, and firing at a distance up. While the gas was burning, there was really only danger from the segregated flames, and from the intense heat. The greater danger lay in the choice and the execution of the methods by which the large flow of gas was stopped, and the huge flames were extinguished. Gas engineers and those conversant with the intricacies of gas supply in such an area as this, and who alone are in a position to appreciate the situation, will agree that the course adopted by Mr. Foulger was the only safe one for the protection of the public, the neighbouring property, and an important part of the Company's distributing system.

Irresponsible daily newspaper critics at the time made various suggestions as to how the work could, in their untrained judgment, have been better accomplished than by the course adopted. One conceived the brilliant idea of shutting-down the supply of gas from the works—little knowing what the application of his drastic proposition would have meant in the way of creating an explosive mixture in the gas distribution system in this important area of London, and of the possible and probable sacrifice of life, limb, and property that would have ensued—to say nothing of the peril and inconvenience within the houses of the consumers. Another critic suggested half-a-dozen loads of sand. His sense of proportion was exquisite. The gulf separating the ends of the pipes was 80 feet in length; and the bottom of the gulf was a considerable depth below the projecting ends of the gas-mains.

These are the two principal mishaps that occurred on the extensive distribution system of the Gaslight and Coke Company during the tenure by Mr. Foulger of the office of Chief Distributing Engineer. They were occasions that demanded presence of mind and quick and skilful action; and both were in evidence. The further interesting feature is that neither of these disasters had its origin in the gas distribution system.

The Underground Works of London.

During the past twenty years or so, an extensive change has come over the occupancy of the subsoil of London streets. The number of the tenants of the subsoil has increased, and their character has altered. Never previously was the gas distribution system subject to so much disturbance as in late years. The new comers include electricity suppliers, hydraulic power distributors, and telephones; and there has been an extensive construction of tubes and electrical works associated with subterranean traffic and surface and shallow tramways. The subway work for the public services and for foot passengers has also to be taken into account as changes of considerable interest within Mr. Foulger's experience. There are at the present time no less than 35 subways in London; and, under Acts of Parliament, the statutory powers for breaking open streets cease and determine where there is a subway, excepting in the event of there being insufficient accommodation in the subway. This has necessitated an enormous amount of work in removing the whole of the distributing plant concerned into these subways, and at all times during the progress of the work maintaining a continuous supply of gas. Take, as an illustration, the construction of the new street running from Holborn to the Strand (Kingsway and Aldwych),

which intersected what may fairly be described as the very heart and most important part of the distributing area of the Gaslight and Coke Company. Inasmuch as this street cut through a large number of cross thoroughfares, it is obvious that, but for a perfect substituted system, the Company would have had a large number of main dead-ends, which are always to be avoided for reasons well known to every gas engineer. What had to be done was to lay a main in the subway constructed under the new street, and pick up, and connect to it, the ends of all converging pipes.

Certainly the largest main alterations of recent years have been necessitated by the underground electrical conduit system of the London County Council Tramways. Unlike the overhead trolley system, the conduit system requires a minimum depth from the surface of the roadway of 3 ft. 9 in., which is generally in excess of the depths at which the gas-mains were originally laid. As the tramways run through the leading thoroughfares and the principal trunk gas-mains do the same—in each case occupying the roadways—a wholesale lowering of both large and small diameter gas-mains has been necessitated. The system that was usually adopted in such cases by the Company, under Mr. Foulger's advice, was to take advantage of the large excavations made by the tramway contractors to lower the pipes without cutting out the joints, making, of course, due provision for the proper levels, and the bringing in of the original syphons for the condensed liquor. Such work as this has, within the last few years, been carried out in practically every main thoroughfare in London where the tramways run.

An important special piece of work was connected with the gas-main alterations required in the construction of the Mansion House subway. When the Central London Railway obtained their parliamentary powers, it was decided that the principal station should be under the large space in front of the Royal Exchange and Mansion House; but it was stipulated that there were to be no openings made in the roadway for such construction. It so happened that the Gaslight and Coke Company had a number of big mains traversing this spot to the seven roadways converging on this point—the very heart of the whole of the City—and the entire network of mains had to be dealt with directly underground. For this purpose, a comparatively small opening was made in the large paved area in front of the Royal Exchange; and at a depth of 26 feet a pipe subway was constructed immediately under the existing passenger subway. The whole of the subsoil of the road was removed, and the concrete supporting the roadway was closely timbered. In this way the mains were dealt with from below. New gas-mains were laid—30 inch and 24 inch—iu the subway, and connected by means of shafts to the existing mains (of various diameters) leading to the seven cross streets. This work was carried out without a hitch; and in fact nobody dreamed what was going on, and the gas consumers suffered no inconvenience.

A Question of Pressures.

Having regard to the special character of the district of the Gaslight and Coke Company, its extent, the great variation of levels of the points of gas use, and the multifarious purposes to which gas through the twenty-four hours is applied, the question of the maintenance of pressures is one of considerable importance. In this respect there has also been a remarkable change. The pressures have to be maintained, for example, to reach the signals of the various underground railways in London, which are all of them lighted by gas. As every 10 feet in descent means a loss of 1-10th of an inch in pressure, and the lowest depth to be reached is 123 feet, this is a matter that has always to be taken into calculation, more especially in bad weather. In fact, it absolutely negatives the possibility of taking refuge in the reduction of pressures in bad weather, as was formerly done when the extremes of condition were less onerous. In addition, incandescent burners, gas engines, cookers, and fires all require three times the pressures originally stipulated in Acts of Parliament, having regard only to the condition of things that existed with the flat-flame burner. It is enacted that the pressure between sunrise and sunset shall not be less than 6-10ths; and between sunset and sunrise 10-10ths. But in the Gaslight and Coke Company's district, they dare not now give less than 20-10ths to 30-10ths pressure. With less they could not properly supply the multitudinous incandescent burners, gas-engines, and cookers in use. In some places near the works, a pressure of 5 inches has to be maintained. Certainly, within Mr. Foulger's time, the whole of the conditions of gas supply have been altered; and indubitably the chief of the distributing department of the Gaslight Company has had to keep himself very much alive to accommodate himself to the changing circumstances. During his official career, the record day's consumption dealt with in the area was 130 million cubic feet; and this reminds of another important change. The night consumption in his earlier days, and until not a great number of years ago, was the principal part of the day's output to be negotiated. That is all changed now. The night consumption—mainly, first through vertical incandescent gas-burners, then through inverted ones, and in smaller degree through electric lighting—has fallen away; but the rising day load has become an important factor in equalizing the output. In other words, the Company are doing, in their large area now, a more profitable business from the fact that the pressures are kept going for more hours of the day than when the Company were confined exclusively to lighting. The heaviest consumption in many parts of London—as is experienced in several of the suburban and provincial districts, is on Sundays between 12 and 2 o'clock, when Sunday dinners are being cooked. It is a no mean difficulty then to maintain the pressures in small districts. But all these great changes have had a beneficial influence on a gas undertaking from the financial point of view—in lowering the night peaks and levelling-up the day valleys. While the distribution department of a gas undertaking is now blamed for being more costly in its working than formerly, it would not be a bad thing for someone to make a study of the other side of the question, and show us what a great influence it has had in making the whole business of gas supply more profitable. That is the aspect of the financial question from the point of view of the recent occupant of the seat of the chief among gas-distributing engineers; and it is a fair one for him to contemplate.

From the sketch that we have given, on Mr. Foulger's retirement, of the expansion and changes witnessed by him of and in the work and business of the Gaslight and Coke Company, and of the influences that have been brought to bear upon that work and business through the modern changes in our Metropolitan life and circumstances, together with the adventitious situations that have confronted him, and have had to be smartly dealt with, it will have been seen that the responsibilities and duties of the office of Distributing Engineer to the Company are immense and exacting, and demand no ordinary skill, and no ordinary strength of purpose and grip of affairs. Without exceeding the limits of our freedom in the position of reviewers of a life's official work, we feel that this article may be concluded by saying that all the attributes required for such a unique office (unique as applying to the Gaslight and Coke Company) have been shown to have been possessed in distinguished degree by the holder who has just relinquished it before—through the misfortune referred to a fortnight since—there was any intention of doing so, and to the regret of Governor, the Directors, his fellow officers, and the staff generally. We hope that, though not actively engaged in official work, Mr. Foulger's large and diversified experience will not be altogether lost to the gas industry, and that, in his retirement from official life, he will enjoy the health and happiness to which his work fully entitles him, and which he richly deserves.

PERSONAL.

GASLIGHT AND COKE COMPANY'S NEW DISTRIBUTING ENGINEER.

We are pleased to be able to congratulate Mr. Henry Sutton Reeson upon his appointment as Chief Distributing Engineer to the Gaslight and Coke Company, in place of Mr. G. F. L. Foulger, whose retirement, following upon an operation, was regretfully announced in the "Journal" earlier this month. Mr. Reeson, who is a son of Mr. J. Reeson, for many years Assistant-Secretary to the Company (and now retired), is only 37 years of age. He was educated at St. Paul's School, West Kensington; and in 1888 he was admitted by the Directors of the Gaslight and Coke Company as a pupil of Mr. F. A. M'Minn, the then Engineer of the Fulham station. On the retirement of Mr. M'Minn, in February, 1890, Mr. Reeson was transferred as a pupil to Mr. H. Iago, Mr. M'Minn's successor as Engineer at Fulham, under whom he completed his articles. In October, 1891, he was put on the Company's staff as Assistant-Engineer of the same station; and he served in this capacity until the end of 1898, when he was appointed Assistant to Mr. Foulger, which position he has occupied since, having also had the management of the distribution department since Mr. Foulger's illness.

While announcing this appointment, we have the greatest possible pleasure in acceding to Mr. Reeson's request to be allowed, through the "Journal," to acknowledge the great value which he attaches to the advantages he has received from his training under Mr. Foulger, and his sincere admiration and esteem for him personally. Those who are acquainted with the exceptional abilities and qualifications of Mr. Foulger, and the work accomplished by him in connection with this particular branch of the gas engineering profession, will agree that Mr. Reeson has enjoyed every opportunity of becoming proficient.

At their meeting on Friday, the Gas Committee of the Bolton Corporation had again under consideration the applications received for the position of Gas Engineer, rendered vacant by the retirement, as already announced, of Mr. William Smith. The salary offered was £500 per annum, rising by £25 yearly to £600. The Committee's selection fell upon Mr. William James Smith, B.Sc., Gas Engineer and Manager to the Carlisle Corporation, who is a son of the retiring Engineer.

Mr. John Macmillan, Manager of the Lochgilphead Gas Company, has been appointed Manager of the Lasswade and Bonnyrigg Gas Company in room of Mr. W. Brown, who, as recently announced in the "Journal," has been appointed to Cardenden. There were 72 applicants. Mr. Macmillan is a native of Rothesay, and he served in the gas-works there for seventeen years. He has been Manager for the past six years at Lockgilphead, where he has been able to reduce the price of gas from 7s. 10d. to 5s. 10d. per 1000 cubic feet, and increase the dividend from 3 to 6 per cent.

OBITUARY.

The death occurred on the 19th inst., at Avelghem (Belgium), in his 53rd year, of M. Aimé Wautelet, the Manager of the Roubaix Gas-Works. Deceased was a member of the Société Technique, having been admitted in 1899.

The members of the Court of Common Council of the City of London received a painful shock at their meeting last Friday, on learning of the death of the Chairman of the Streets Committee, Mr. Charles Alfred Teuten, whose name has come rather prominently before our readers lately in connection with the report, given in the "Journal" last week, of the deputation of the Committee who recently visited various Continental cities to inspect the systems of public lighting in use. It appears that deceased was attending to his civic duties on the 16th inst.—one of his latest official acts being the signing of the report; but two days afterwards he was taken seriously ill, and died on Wednesday. Mr. Teuten had been a member of the Common Council for eight years, and was highly esteemed by his colleagues for his business experience, common sense, and determination; and at the meeting last Friday testimony was borne to his worth as a member of the Corporation, of which he had also been Chairman of the Markets Committee. The interment took place on Friday; Mr. T. Pimm, a representative of the same ward as the deceased (Queenhithe), attending on behalf of the Council. Mr. Teuten was 57 years of age.

We regret to record the death, on Wednesday last, in his 57th year, of Mr. John Meiklejohn, the Engineer and Manager of the Yorktown and Blackwater Gas Company. Deceased had been out of health for some twelve or eighteen months, but had been able to attend to his duties until the week before his death, when his illness became serious. Prior to entering the service of the Yorktown Company, about eight years ago, Mr. Meiklejohn was with the Aldershot Gas and Water Company. He entered upon his new duties when the undertaking was not in a very prosperous condition; but, with the assistance of a capable Board of Directors, he was soon able to turn it into a very flourishing concern. As showing the progress of the Company, it may be mentioned that in 1879 the consumption of gas was only 2 million cubic feet per annum, whereas last year it was 63 millions; and since 1897 the price has been gradually reduced from 4s. 6d. to 3s. 6d. per 1000 cubic feet. It may be remembered that the Company are now in Parliament for powers to extend their gas limits, change their name, and acquire lands for the purpose of erecting generating stations for the supply of electricity. Mr. Meiklejohn has consequently been removed at a very critical time; and his death is much regretted, not only by the Directors, the staff, and the employees of the Company, but by a large circle of friends in Yorktown, Camberley, and Aldershot, by all of whom he was greatly esteemed. The interment took place in St. Michael's Churchyard, Yorktown, last Saturday; the chief mourners being the five sons of the deceased and his brother, Mr. Charles Meiklejohn, of Rugby. Among those present were the Chairman, Directors, Officials, and Workmen of the Company, some of whom were pall-bearers. They also sent floral tributes; that from the Directors and officials conveying their "deepest sorrow for the loss of a most efficient and highly valued co-worker and friend." Mr. Meiklejohn was a member of the Institution of Gas Engineers and of the Southern District Association of Gas Engineers and Managers. He was also a member of the Border Lodge of Freemasons (No. 2475).

NOTES FROM WESTMINSTER.

The only movement in Gas Bills worth mention this week is the complete victory in the House of Lords of the Gaslight and Coke Company's measure, which will open up a new chapter in the history of Metropolitan Gas Supply, and, in fact, in that of the gas industry generally.

Gaslight and West Ham Bill. The objects of the Bill are by this time well known. The amalgamation of the West Ham Gas Company is at the head of the proposals; and the reduction of the standard of illuminating power from 16 to 14 candles comes in a good second. This latter proposal will make the standard of illuminating power uniform throughout London; and, with uniformity in the capital, opposition to reduction of illuminating power standards throughout the country will be more ridiculous than ever. By agreement, but not from any particular willingness on the part of the promoters, a calorific power standard also stands as part of the Bill.

The Committee before whom the Bill came last Friday week, and by whom it was disposed of early last week, was presided over by Lord Clifford of Chudleigh. The only opponents were the West Ham Corporation; but they made a bad case, the hollowness of which was shown towards the tail-end of the proceedings, when the Chairman fairly cornered the versatile Mr. Freeman, K.C., on all the points that he sought to make for his clients. The case for the Bill was admirably put before the Committee by Mr. Balfour Browne, K.C.; and after hearing the evidence of the witnesses (which was not shaken in the least in cross-examination), neither the members of the Committee, nor any other disinterested person present, could conclude otherwise than that public advantage in the amalgamation was conclusively proved. The witnesses for the Bill were Mr. Corbet Woodall, Mr. J. Lister Godlee (the Chairman of the West Ham Gas Company, and lately elected to the Board of the Gaslight and Coke Company), Mr. T. Goulden (the Chief Engineer of the Company), Mr. D. Milne Watson (the General Manager), and (the only witness not directly associated with the management of the Company) Mr. H. E. Jones.

Though the West Ham Corporation would have preferred to see the rejection of the whole measure (or at least they hinted at this), they centred their efforts on trying to secure the terms extended that were gained in the Lower House. It will be remembered that, though opposed to the principle introduced, the Gaslight and Coke Company agreed to keep open the West Ham works for a decade, substantially on the scale that obtained prior to the promotion of the Bill; but the West Ham Corporation were anxious to assure the continuance of their enjoyment of the rates from the assessment of the works for a longer period. They have pressed the promoters for this with a fervour and an unreasonableness that took no count of the practical expediency of what was being asked for. Before the Committee the Corporation put the time that the works should definitely be continued at twenty years; and they also asked that the Company should maintain for a similar period the number of workmen and staff at the level existing before the promotion of the Bill. At the close of twenty years, the Corporation wanted to be practically the arbiters of whether or not the works should still be continued, with the offices of the Board of Trade to be at command to settle any difference. The Corporation paid no heed whatever to the interests of the consumers or to those of the proprietors who had supplied the capital for the two concerns. The advantages of amalgamation to the consumers, the public, and the stockholders, together with the economic considerations, were well set out in the evidence of the Governor and the General Manager. The Committee were satisfied that the proposals of the measure were in the interests of consumers and public, and that the West Ham Corporation were in their requests exceeding what was right and desirable. The requests were therefore rejected. The preamble of the Bill was proved; and small changes of no public importance were made in certain of the clauses.

Corporations and the Supply of Outside Areas. The Oldham Corporation Bill was heard of again during the past week when, before Lord Clifford of Chudleigh's Committee, the Lancashire Electric Power Company contested the right of the Corporation to be given powers of electricity supply outside the borough—in Chadderton, Royton, Crompton, Lees, and Limehurst. The Corporation asked that, where these areas were unable to obtain, upon reasonable terms, a supply of electricity from any Company authorized to supply in the district, the Corporation should be empowered, with the consent of the Board of Trade and the local authority of the district, to afford a supply. This clause is identical with one that appears in the Electric Lighting Acts Amendment Bill which has lately passed the Lords, and is now before the House of Commons for third reading. The Lancashire Electric Power Company have authority to supply and take over Provisional Orders in the districts named; and the Corporation want to be in precisely the same position. The result of a two days' discussion was that the clauses were passed, subject to their not being acted upon without the consent of the Lancashire Power Company, which is not to be unreasonably withheld. On this point there is to be reference, if necessary, to the Board of Trade.

Glamorgan Water. The Glamorgan Bill, for the constitution of a Water Board, which occupied so much time before the House of Commons Committee, of which Sir Luke White was the Chairman, was last Friday before a Committee presided over by the Earl of Kintore. The case for the Bill was still being presented when the Committee rose on Friday. The proceedings are to be resumed to-day.

Irish Association of Gas Managers.

The annual meeting of the Association will be held in the Dolphin Hotel, Dublin, on Tuesday, the 10th prox. We learn from the programme issued by Mr. George Airth, of Dundalk, who has temporarily undertaken the secretarial duties for Mr. James Whimster, for the reason which prevented his attendance at the meeting of the Institution in June, that, in addition to the Inaugural Address of the President (Mr. F. T. Eustace, of Tullamore), there will be two papers—viz., "Experience with a Small Sulphate Plant," by Mr. G. Saville, of Drogheda; and "Some Notes and Queries on the Control of Small Gas Undertakings," by Mr. J. E. Enright, of Tralee. There will also be a lecture by Mr. Henry O'Connor, F.R.S.E., entitled "Inverted Incandescent Lights." Arrangements have been made for an excursion, the day after the meeting, from Bray, through the Rocky Valley, Powerscourt, Enniskerry, and Dargle, back to Bray. Luncheon will be served at Enniskerry and tea at Bray.

A Swiss experiment for the transformation of crude oil into liquid gas is reported by the American Consul at Zurich to have met with great success. The product is a transportable liquid, which is simply evaporated as used; and it can be employed for lighting, heating, cooking, soldering, and welding purposes. The gas is non-poisonous, while its installation cost is said to be low, and manipulation simple and without danger.

INVESTIGATIONS ON GAS COALS

By the Experimental Works of the German Association.

An exhaustive report was presented at the meeting of the German Association of Gas and Water Engineers at Frankfort the week before last, on the results of a large number of examinations of descriptions of coal in common use for gas manufacture in Germany. The examinations had been made at the Instructional and Experimental Works of the German Association at Carlsruhe under the supervision of Professor H. Bunte. Though the coals examined were mostly of German origin, and therefore unlikely to be used in gas-works in this country, some of the data obtained are of general application, and consequently are worth reporting in the "Journal." The following is an abstract of the report, made with special reference to the points likely to be of more particular interest to English gas men.

The Instructional and Experimental Works had up to the end of May carried out examinations of sixty-six varieties of coal, of which fifty-two are dealt with in the present report. The earlier investigations disclosed difficulties partly due to faults in the experimental plant, partly in the methods of investigation, and partly to the want of proper appreciation of the manifold influences at work. These difficulties have been gradually overcome. The results now obtained are believed to surpass in reliability and precision the results of previous investigations.

The first section of the report deals with the chemical examination of coal. Owing to the fact that most pits are working a variety of seams of different ages, the coal raised by them commonly shows considerable variations in composition and character, so that it is not satisfactory to name the coal simply by the pit from which it is derived. The sampling is a most important operation. It was carried out as follows: When discharging a waggon, every twentieth or thirtieth shovelful was thrown aside into a basket, so that the proportion of lumps and small coal in the sample corresponded with the bulk. All the lumps were broken to the usual working size—*i.e.*, about that of the fist. The rough sample thus obtained, weighing 5 to 10 cwt., was spread out on a solid clean platform of concrete, or the like, and broken to the size of walnuts. By repeated turning over with a shovel, the broken coal was thoroughly mixed, made into a square $3\frac{1}{2}$ to 4 inches in depth, and divided by two diagonals into four parts. The coal in the two opposite triangles was removed. The rest was broken small, to about the size of cob nuts, mixed, spread out, and divided as before. This process was continued till a sample about 22 lbs. in weight remained, which was then put up in well-closed vessels for examination. The consignment of coal reached the experimental works in the original waggons as loaded at the pit or at the gas-works. Two parallel samples were taken from each waggon, and these showed good agreement provided the coal had been broken small enough in the waggon. Care must be taken in discharging from a waggon that a separation of the different components of the bulk of the coal is not effected by running it down a slope. With these precautions the sample represents quite satisfactorily the average of the consignment.

The results are given, in a table, of the ultimate analyses of fifty-two consignments of coal, the composition of the coal substance, the calorific value, and the determination of the volatile matter or coke. Twenty-five of these consignments were of Ruhr coal, twelve of Saar coal, ten of coal from Saxony, and five of Silesian coal. The relation between chemical composition and the calorific value of the coal is shown to be very simple and obvious. The behaviour on carbonization, on the other hand, appears to be affected by very manifold influences, and the results of carbonization vary to a far greater extent than the differences in the composition of the material. It may be anticipated, however, that by exhaustive study of the coals and observation of as many influences as possible, the laws governing the behaviour of the coal on carbonization may be discovered.

The second section of the report comprises a description of the experimental plant of the Association. This has already been described in earlier volumes of the "Journal." It will suffice to say now that it consists of a setting of two retorts, each 8 ft. 6 in. long, and having an interior heated surface of $36\frac{1}{4}$ square feet. The plant is equipped with complete condensing, washing, exhausting, purifying, and measuring apparatus, as well as with pyrometers and special arrangements for the taking of samples of gas. The gas passes into a holder which is capable of receiving one day's output of the experimental plant. The gas required for further investigation is received in an experimental holder of about 70 cubic feet capacity. A regular known proportion of the total make can be passed into this holder by means of a gas-meter acting as a pump on the inlet pipe to it, the axis of which is coupled by chain-gearing with that of the larger gas-meter by which the gas entering the large holder is measured. The proportion of the small sample to the bulk may be varied by changing the cogwheels by which the two meters are geared together. In order to exclude as far as possible fortuitous errors of experiment, a long series of trials was made of each sample of coal, the carbonization extending over eight to ten days for each sample.

The third section of the report gives the form on which the results of an investigation are recorded, with figures for a coal from Saxony to show the way in which the form is filled in. The fourth section reports the results of the carbonization trials of the different coals. These results are tabulated in two tables arranged according to the coal fields from which the samples are derived. As these samples, however, are all of German origin, it would be of little use to reproduce the figures here. Diagrams are also given showing the proportions by weight of the products of distillation of the different coals. The total of the weights of the products should—assuming that no loss has taken place on distillation—agree exactly with the weight of coal taken. As a fact, about 95 to 97 per cent. of the weight of coal is accounted for. The rest escapes on the one hand as products which are not determinable—as, for instance, the gas which escapes when the retort is charged and drawn, the scurf which collects in the retort, and the deposit in the ascension pipe. Further, there are the sulphur, cyanogen, and ammonia retained by the purifying material. The coke is drawn into a closely closed vessel and weighed as soon as possible, so that there is very little loss by combustion. When these and other small losses, and the inevitable errors of observation, are taken into account, the total weight of the products still falls short of the weight of coal. Other diagrams are given in which the loss on carbonization is excluded, and the water and ash contained in the coal are allowed for.

It is apparent from the diagrams that the quantity of gas obtained increases as the yield of coke falls off. For the valuation of coal for gas manufacture, however, not only the quantity, but also the nature of the resultant products is clearly of importance. Primarily, the quality of the coke has to be considered. So far only such coals have been examined as have long been in use as gas coals. Hence the greater number of them yielded normal gas coke. Only in the case of a few recent coals has the quality of the coke been doubtful. The quality of the gas is also of considerable importance. This point is referred to later in the report. The results shown in the tables, however, so far as they refer to the quality of the gas, relate to the temperature of carbonization of approximately 1175° C., or between 1165° and 1185° C. The trials are divided into two sets according to the point of view from which they were undertaken. The first set comprises a study of the effects of conditions of carbonization when different coals are used. The second set furnishes comparative values to serve as a basis for the industrial valuation of the coals. In the first instance the trials were made primarily from the first point of view.

Influence of the Conditions of Carbonization.

Experience teaches that the various varieties of coal which are in general use for gas making present more or less resistance to the course of gasification. That is to say, the coal substance is decomposed after more or less prolonged heating, or there are coals which are easily or difficultly gasifiable. Thus using the same weight of charge and the same temperature (1160° C.) of the retort, certain coals—*e.g.*, Unser Fritz and Ewald, both Ruhr coals—are completely carbonized in about $4\frac{1}{2}$ hours, whereas other coals—*e.g.*, Dahlbusch, Königin Elisabeth, and Neuessen (also Ruhr coals)—are not completely carbonized at the end of 6 hours. It is most important to recognize this difference in practical working in order to use the coal to best advantage. The differences are not often so great as in the examples quoted. Curves showing the course of carbonization have been drawn up for the various coals examined, and four typical curves are reproduced in the report. (See also figs. 1 and 2.) Trials have also been made to determine the influence of the size of the coal on the rate of carbonization. *Cæteris paribus*, lump coal carbonizes more rapidly, and yields a greater quantity of gas by the end of 5 hours, than the same coal when broken quite small. Whether this behaviour depends in reality on the size of the coal, or whether it is connected with the nature of the particular coal and its coke, can only be settled by further tests. Observations so far also do not admit of any certain conclusion being drawn as to the interdependence between changes in the weight of the charge and in the temperature and the quantity and nature of the products.

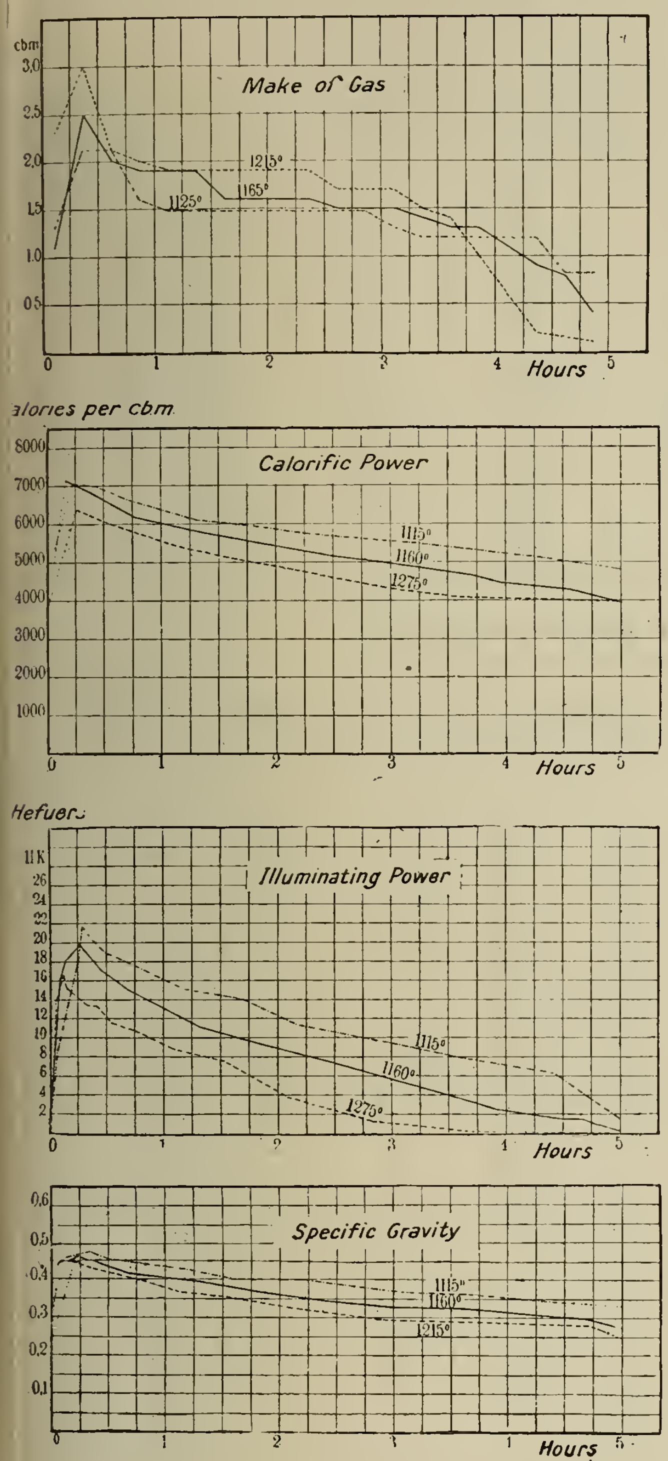
Course of Carbonization and Effect of Temperature.

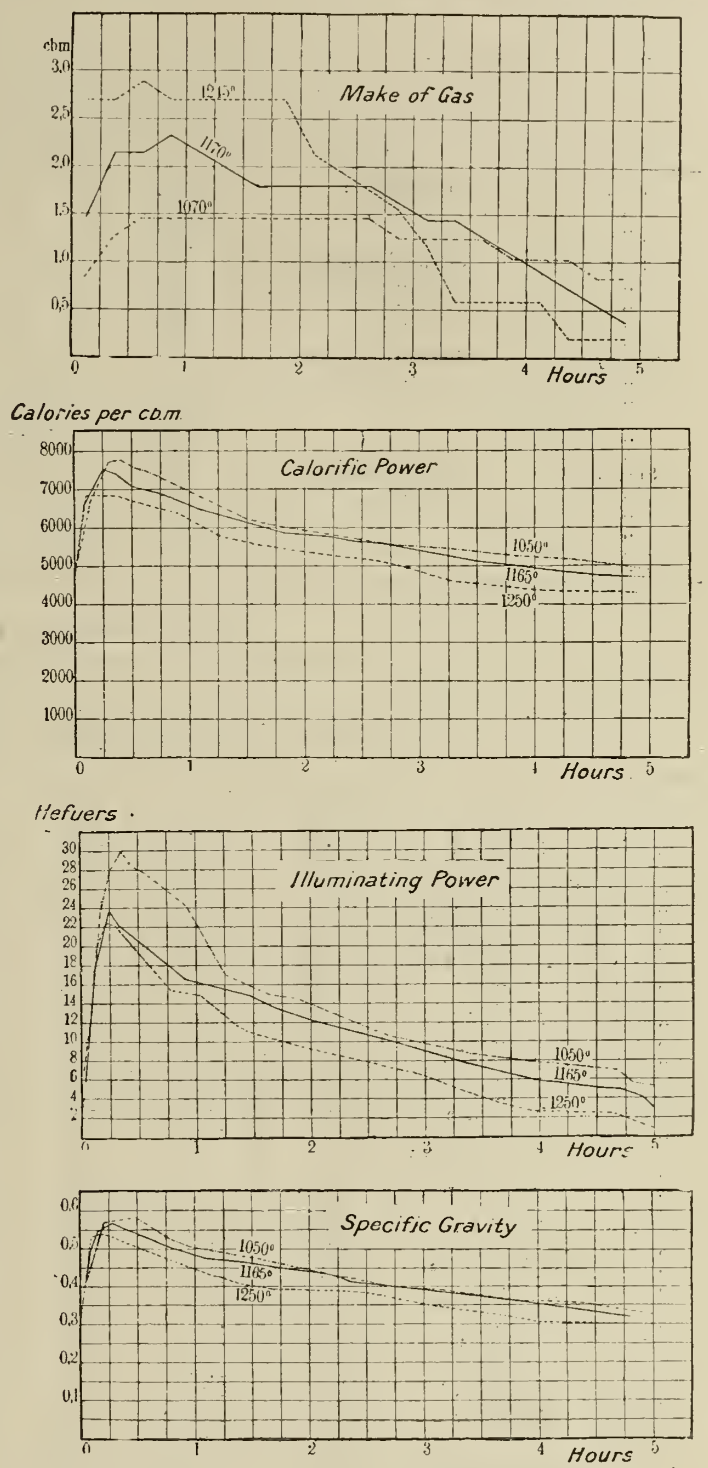
The influence of the temperature of the retort on the quantity and quality of the gas is next considered. A typical coal from each of the four fields was carbonized at two or three different temperatures. The makes of gas, calculated to cubic feet, at 60° Fahr. and 30 inches saturated, per ton of coal, are shown in Table I. (See also diagrams, figs. 1 and 2.)

Table I.

Origin of Coal.	Pit.	Temp. of Carbonization.	Cubic Feet of Gas per Ton of Coal.
Ruhr district . .	Königsgrube	1125° C.	10,777
,, . .	,,	1165° ,,	11,315
,, . .	,,	1215° ,,	11,890
Saar district . .	Reden-Bildstock	1125° ,,	12,465
,, . .	,,	1230° ,,	14,045
Saxony . . .	Hedwig and Frieden	1070° ,,	9,545
,, . . .	,,	1170° ,,	11,695
,, . . .	,,	1245° ,,	12,740
Silesia . . .	Königin Louise	1135° ,,	11,505
,, . . .	,,	1220° ,,	13,230

It will be seen that the higher the temperature, the greater the make of gas from the same coal. The increase in make





Diagrams showing Course of Evolution of Gas, Calorific and Illuminating Powers, and Specific Gravity throughout Carbonization at Three Different Temperatures.

Fig. 1.—For a Typical Ruhr Coal (Königsgrube). **Fig. 2.—For a Typical Coal from Saxony (Hedwig and Frieden).**

ısults, on the one hand, from the more rapid and complete composition of the coal substance owing to the greater heat, d the brisker transmission of heat through the fire-brick retort; d, on the other hand, from greater dissociation of the volatile oducts or gas at the hot walls of the retort. Both influences t in the same direction on the resulting volume of gas.

In regard to quality, curves are given showing the calorific lue, illuminating power, and specific gravity of the gas. These rves, and also the curve for the make of gas, are reproduced r two samples of coal—viz., the Königsgrube coal from the ıhr field, and the Hedwig and Frieden coal of Saxony, in the nexed diagrams, figs. 1 and 2. From them it appears that the ect of temperature is to lower the values through a greater composition of the heavy hydrocarbons and of methane. Thus e curves for these values fall as we pass from the lower to the gher temperatures. The curves for calorific value and specific avity are, however, comparatively flat. That is to say, they not change over a very wide range as distillation proceeds, cause methane is not readily decomposed. On the other hand, e curves for illuminating power rise rapidly at first and then ll away sharply, owing to the readiness with which the heavy drocarbons, to which the illuminating power is due, are deımposed. Although illuminating power now is of comparatively tle importance, it was determined in all the trials; but no tempt was made to work to a definite illuminating power. The illuminating values therefore vary within wide limits, and should be disregarded in valuing the coal or the gas.

The effect of temperature on the calorific value is shown in Table II. for four typical coals. Another column gives the product of the calorific value of unit volume of the gas and the yield of gas from a given weight of coal. This product may be called the "calorific figure," and shows the number of calories obtained in the gas by carbonizing unit weight of the coal. It will be seen that, while the calorific value of unit volume of the gas falls as the temperature of carbonization rises, the "calorific figure," on the other hand, increases. Consequently, it follows that the increase in the make of gas outweighs the diminution of calorific value owing to the decomposition of the heating constituents of the gas, and that the increased volume of gas obtained is not to be traced to decomposition alone. Illuminating power is affected much more than the calorific power by the rise in the temperature of carbonization, and the increased yield of gas no longer suffices to equalize the loss of illuminating hydrocarbons. The "illuminating figure"—*i.e.*, the product of the candles obtainable from unit volume of the gas per hour and the yield of gas from unit weight of the coal—therefore falls as the temperature increases. This is shown by the figures given in Table II. The gas was consumed at the rate of 150 litres (5·3 cubic feet) per hour.

The sulphuretted hydrogen in the crude gas as well as the

TABLE II.

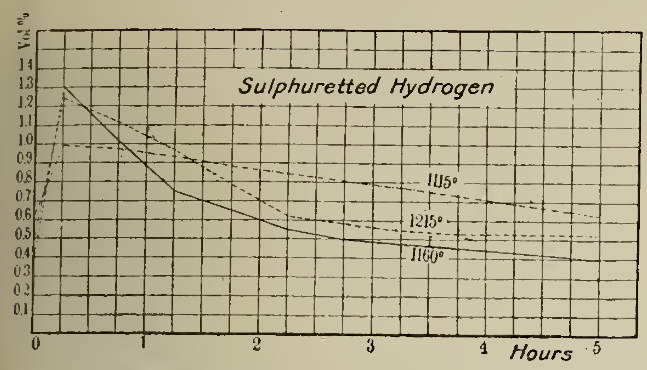
Coal. District.	Coal. Pit.	Temperature of Carbonization. Deg. C.	Gross Calorific Power of Gas. B.Th.U. per Cubic Foot at 60° Fahr. and 30 in.	B.Th.U. in Gas per lb. of Coal Carbonized.	Illuminating Power of Gas. Candles per 5·3 Cubic Feet per Hour.	Candles in Gas per lb. of Coal Carbonized.	Specific Gravity of Gas.
Ruhr	Königsgrube	1115	607	3411	10·8	15·32	—
,,	,,	1160	592	3456	8·55	12·59	0·372
,,	,,	1215	568	3456	—	—	—
,,	,,	1275	—	—	5·13	7·89	—
Saar	Reden-Bildstock	1130	646	3942	—	—	—
,,	,,	1150	—	—	11·43	18·16	—
,,	,,	1155	629	3969	—	—	0·393
,,	,,	1240	609	4086	9·27	15·82	—
,,	,,	1250	—	—	8·91	15·59	—
Saxony	Hedwig and Frieden	1050	652	3406	—	—	—
,,	,,	1165	620	3740	11·52	17·24	—
,,	,,	1180	618	3798	—	—	0·413
,,	,,	1200	604	3802	—	—	—
,,	,,	1210	—	—	10·53	16·71	—
,,	,,	1250	598	3870	8·82	14·51	—
Silesia	Königin Louise	1110	630	3263	10·35	13·55	—
,,	,,	1140	589	3348	7·65	11·58	—
,,	,,	1195	579	3506	7·11	10·89	0·407
,,	,,	1250	564	3816	—	—	—
,,	,,	1260	—	—	5·76	9·85	—

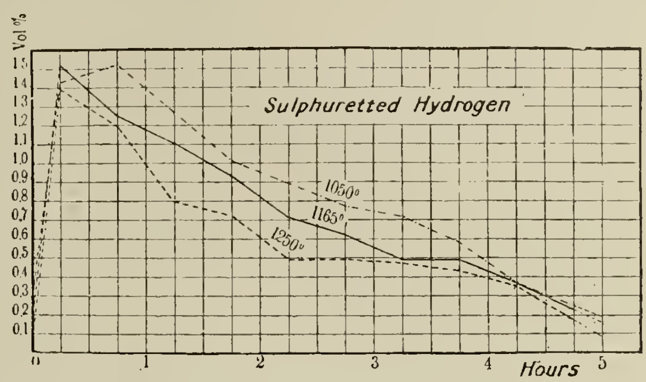
TABLE III.—*Sulphur and Nitrogen Compounds.*

Coal. District.	Coal. Pit.	Sulphur in Coal.	Nitrogen in Coal.	Temp. of Carboniza-tion.	Sulphuretted Hydrogen in Crude Gas. Vols. Per Cent.	Sulphur in Purified Ga Grains per 100 Cub. Ft.	Ammonia in Gas. Grains per 100 Cub. Ft.	Hydrocyanic Acid in Gas. Grains per 100 Cub. Ft.	Percentage of Total Nitrogen in Coal Recovered as Ammonia.	Percentage of Total Nitrogen in Coal Recovered as Cyanogen.
Ruhr	Prosper	1·11	1·57	1190	0·85	21·8	420·3	99·6	13·00	2·11
,,	,,	1·11	1·57	1230	0·70	25·3	373·5	103·1		
,,	Dahlbusch	0·98	1·68	1180	0·66	24·5	392·4	104·4	11·70	1·97
,,	,,	0·98	1 68	1210	0·46	22·7	396·9	104·4		
,,	Ewald Fortsetzung	1·40	1·63	1140	0·88	38·9	429·1	141·1	14·40	4·10
,,	,,	1·40	1·63	1240	0·77	46·7	349·7	207·1		
,,	Königin Elisabeth	0·80	1·46	1170	0·59	23·6	408·1	87·4	14·60	2·41
,,	,,	0·80	1·46	1225	0·55	26·7	357·3	110·0		
,,	Rheinbaben	1·63	—	1100	0·95	33·2	—	—	—	—
,,	,,	1·63	—	1165	1·05	33·6	—	—	—	—
,,	,,	1·63	—	1230	0·94	34·1	—	—	—	—
,,	Zollverein	1·06	—	1220	0·90	28·4	—	—	—	—
,,	,,	1·06	—	1260	1·39	31·5	—	—	—	—
,,	Königsgrube	0·95	1·64	1115	0·77	23·2	353·0	126·6		
,,	,,	0·95	—	1160	0·66	21·4	—	—	10·50	3·48
,,	,,	0·95	1·64	1215	0·76	17·9	283·2	204·5		
,,	Graf Moltke	3·15	1·35	1115	0·97	58·3	366·1	106·6	13·50	3·35
,,	,,	3·15	1·35	1205	0·97	65·5	269·1	132·3		
,,	Rheinelbe and Alma	0·96	—	1180	1·08	13·5	—	—	—	—
,,	,,	0·96	—	1210	1·08	14·8	—	—	—	—
,,	Unser Fritz	1·63	—	1110	1·47	31·9	—	—	—	—
,,	,,	1·63	—	1220	1·11	27·5	—	—	—	—
Silesia	Dubensko	0·26	1·29	1100	0·80	12·7	503·4	105·7	21·40	3·13
,,	,,	0·26	1·29	1215	0·62	15·7	445·9	113·2		
,,	Königin Louise	0·64	1·61	1140	0·35	11·4	367·5	76·4	12·40	2·00
,,	,,	0·64	1·61	1220	0·33	8·7	294·5	92·6		
,,	Donnersmark	0·51	1·50	1135	0·46	8·7	419·0	91·8	15·20	2·69
,,	,,	0·51	1·50	1235	0·50	8·7	334·3	115·7		
Saar	Maybach	0·80	—	1110	—	10·0	—	—	—	—
,,	,,	0·80	—	1175	—	12·7	—	—	—	—
,,	Kamphausen	0·93	1·56	1165	0·86	19·2	221·9	79·5	8·45	1·63
,,	,,	0·93	1·56	1205	0·64	21·8	242·5	62·0		
,,	Dudweiler	0·40	—	1155	0·69	14·8	—	—	—	—
,,	,,	0·40	—	1200	0·73	13·5	—	—	—	—
,,	,,	0·40	—	1230	0·83	10·5	—	—	—	—
,,	Reden-Bildstock	0·75	1·19	1130	0·69	15·7	282·8	74·3	13·50	3·00
,,	,,	0·75	1·19	1240	0·55	17·5	210·5	99·6		
,,	Heinitz (Lump)	0·45	—	1155	—	11·8	—	—	—	—
,,	,,	0·45	—	1200	—	13·5	—	—	—	—
,,	Velsen	0·56	—	1140	0·77	14·8	—	—	—	—
,,	,,	0·56	—	1180	0·63	12·7	—	—	—	—
,,	,,	0·56	—	1220	0·76	13·1	—	—	—	—
Saxony	Zwickauer Brückenberg	1·44	—	1130	—	27·5	—	—	—	—
,,	,,	1·44	—	1170	—	28·4	—	—	—	—
,,	,,	1·44	—	1190	—	29·3	—	—	—	—
,,	,,	1·44	—	1205	—	30·6	—	—	—	—
,,	Bockwa-Hohndorf	0·48	1·44	1100	0·87	16·6	255·2	86·5	8·70	2·32
,,	,,	0·48	1·44	1200	0·97	26·2	164·3	104·0		
,,	Wilhelm	1·14	1·26	1100	1·01	24·0	389·0	97·8	17·00	3·10
,,	,,	1·14	1·26	1200	0·72	21·0		132·3		
,,	Hedwig and Frieden	0·85	—	1050	0·95	18·8	—	—	—	—
,,	,,	0·85	—	1165	0·82	24·5	—	—	—	—
,,	,,	0·85	—	1250	0·67	25·8	—	—	—	—
,,	Zwickauer Bürger	1·16	1·16	1085	1·32	39·3	393·5	114·8	15·40	3·74
,,	,,	1·16	1·16	1225	1·22	48·1	247·8	129·7		
,,	Vereinsglück	0·93	—	1100	—	22·3	—	—	—	—
,,	,,	—	1·44	1125	—	—	494·0			
,,	,,	0·93	—	1150	—	22·7	—	97·8	15·20	2·40
,,	,,	0·93	1·44	1215	—	24·0	292·0			

sulphur in the purified gas were determined on a large number of samples of coal for different temperatures of carbonization; and the results are shown in Table III. Figs. 3 and 4 are diagrams showing the curves of variation of sulphuretted hydrogen throughout the period of carbonization at three different temperatures for the two classes of coal for which diagrams have already been given. It will be seen that as the temperature of carbonization rises, *cæteris paribus*, the proportion of sulphuretted hydrogen in the gas decreases; while the sulphur compounds in the purified gas as a rule increase. Particular results, however, do not tally with the general tendency of the sulphur compounds to increase with the temperature. This is not surprising, having regard to the very varying proportions of sulphur in the coal and the different combinations in which it exists therein—viz., partially as organic sulphur, partially as pyrites, and partially as sulphate. As a rule, however, a large proportion of sulphur in coal corresponds with a great proportion of sulphur in the gas.

The ammonia evolved in the carbonization of coal increases in





Diagrams showing Course of Evolution of Sulphuretted Hydrogen throughout Carbonization at Three Different Temperatures.

Fig. 3.—For a Typical Ruhr Coal (Königsgrube). Fig. 4.—For a Typical Coal from Saxony (Hedwig and Frieden).

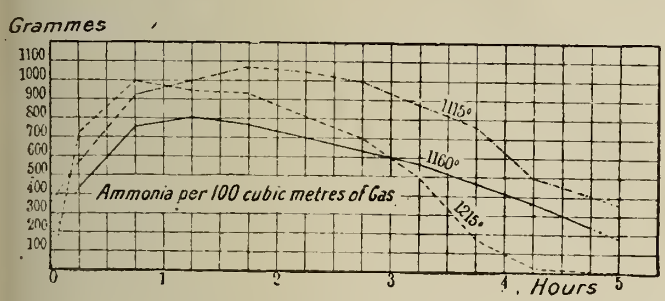
the first hour or so of carbonization, and then slowly decreases until distillation is finished. This may be seen from figs. 5 and 6 for two classes of coal. When the temperature of carbonization is increased, the point of the maximum production of ammonia is brought nearer the beginning of carbonization. The total yield of ammonia decreases as the temperature increases, as will be seen from the figures given in Table III., and from figs. 5 and 6. Table III. shows also the amount of cyanogen in the crude gas and its relation to the temperature. The nitrogen compounds resemble the sulphur compounds in that as the temperature rises the compounds of these elements with hydrogen—viz., ammonia and sulphuretted hydrogen—are less persistent, and compounds of carbon—viz., cyanogen and carbon bisulphide—are formed more freely. The coals from Saxony, however, behave peculiarly. If the free ammonia in the gas at the ascension pipe is determined and compared with the total yield of ammonia, it will be found that the proportion of free ammonia is very low. This is due to the fact that the greater part of the ammonia is combined in the form of ammonium chloride, owing to the high proportion of chlorides in these coals.

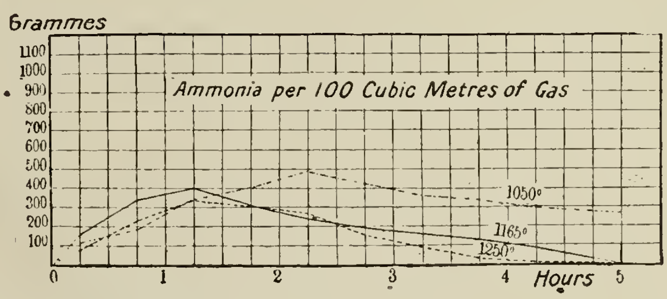
In regard to the composition of the gas in the course of the period of carbonization, the proportion of methane diminishes towards the end of that period owing to its decomposition by the higher temperatures which then prevail. The proportion of hydrogen, on the other hand, increases considerably, owing to the more and more complete decomposition of the heavy hydrocarbons. Consequently, there is the well-known effect of diminution of the calorific value and illuminating power of the gas towards the end of the time of carbonization. The proportion of carbonic oxide remains practically unaltered throughout the carbonization period.

Behaviour of Different Coals with Change of Temperature of the Settings.

The effect of temperature on the course of the process of distillation, and on the quantity and description of the products, and of the gas in particular, having been shown by examples, the question may now be considered whether the behaviour is identical for different coals when the most important condition of the trial—viz., the temperature—is altered, or whether the individual characteristics of the particular coals or of coals of different origin are of paramount influence. If the temperature and the yield of gas are plotted out in the diagram—the make of gas as abscissæ, and the temperatures of the setting as ordinates—it will be found that the curves obtained are kinked, and show small irregularities due to other influences coming into play during carbonization, and obscuring any simple relation between temperature and yield of gas. Nevertheless, it can be seen that with all the coals on which the results have been thus plotted out, the curves take one general direction for the particular class of coal. The four lines so obtained for the four classes of German coal examined are shown in fig. 7.

It will be seen that they are very similar, and deviate but little from parallel. This is the more surprising as the number of coals examined of each class has been comparatively few. It is evident from the diagram that the individual properties of the gas coals





Diagrams showing Course of Evolution of Ammonia throughout Carbonization at Three Different Temperatures.

Fig. 5.—For a Typical Ruhr Coal (Königsgrube). Fig. 6.—For a Typical Coal from Saxony (Hedwig and Frieden).

of the different fields are subordinated, so far as the yield of gas is concerned, to the paramount influence of the temperature of distillation. It is also evident from the diagram that coals of different origin are affected in the same sense, and in nearly the same degree, by a rise in temperature; so that within the limits of usual heats of carbonization a rise of temperature of about 50° C. corresponds with an increase in the yield of gas of about 2 cubic metres per 100 kilos. of coal (about 760 cubic feet per ton). It may similarly be shown that the "illuminating figures"—*i.e.*, the product of the illuminating power and the yield of gas—for the different coals are likewise affected to a preponderating extent by the temperature of carbonization. In this case the curves trend downwards, towards the lower illuminating figures, as the temperature increases; but the decrease of the "illuminating figure" with a rise of temperature is approximately the same for all classes of coal. Thus, even in regard to the illuminating value obtainable in the gas from a particular class of coal, there is no decided difference to be detected between the different classes.

Valuation of Gas Coals.

In the valuation of gas coals, a large number of conditions are of importance, as they all have an economical influence. They might be classed as follows: (1) The purchasing value—viz., price, weight, degree of purity, safety of storage, or freedom from liability to change, &c.; (2), selling value of the products—viz., yield and quality of the gas, yield of coke, production of tar and ammonia, and value of the coke as furnace fuel; and (3), working value—viz., time required for carbonization as affecting the number of the settings and the fuel consumed, the quality of the coke, tar, and carbon, and their influences on working without interruption, impurities, such as sulphuretted hydrogen, total sulphur, &c. It must, however, be remembered that the valuation in many cases can only be determined after consideration of local conditions, such as the geographical position, the apparatus, and the working arrangements of the gas-works, and much else. So far, however, as the nature and quantity of the products and bye-products are concerned, a basis may be found in the reports of trials of the coals. From a general standpoint, the valuation of gas coals may follow the following considerations.

The most important and most valuable product is the gas; and its quality must be judged at the present day primarily by its calorific value. As soon as the important question of the calorific power obtainable from the coal in the gas (*i.e.*, the "calorific figure") has been settled, a comparison may be made between the calorific value of the raw material and the calorific value of all the products—viz., gas, coke, and tar. The method of determining the "calorific figure" for the gas has already been referred to, and the results obtained experimentally for a large number of typical German coals have been given in the tables which accompany the original paper. In regard to the calorific value of the coke, determinations were made with the calorimeter of a great number of varieties of coke; and it was found that, with small fluctuations, the calorific power of the pure coke substance was 7950 calories per kilo. (14,310 B.Th.U. per lb.). This value may be taken as a basis for calculation for any coal. The calorific value of the tar also is liable only to small fluctuations;

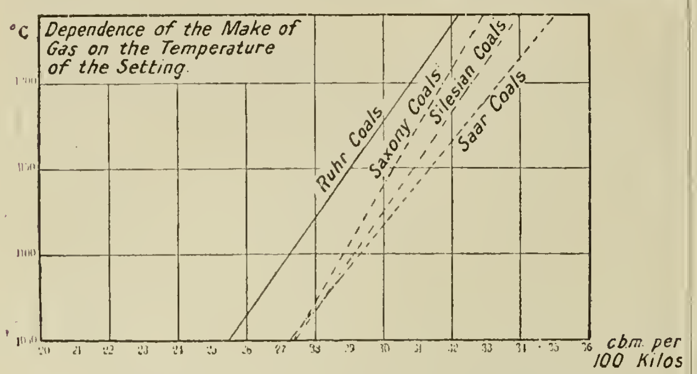


Fig. 7.—Diagram showing the Dependence of Make of Gas on the Temperature of the Setting for Four Classes of Coal.

and a mean value of 8800 calories per kilo. (15,840 B.Th.U. per lb.) may, therefore, well be adopted. By this method of calculation, round figures are obtained, showing that the calorific value of the coal is to be traced within a small percentage in the products. The greater part of it remains in the coke; about 10 per cent. is found in the tar; and about a quarter of the calorific value appears in the gas. The "calorific figure," however, as already remarked, increases with the heat of the setting—that is to say, the fraction of the calorific value of the coal which appears ultimately in the gas increases with the temperature. The rise in the percentage of the total heat of the coal recovered in the gas may be shown by a diagram of which the ordinates are the temperatures of carbonization, and the abscissæ the percentages of the calorific value of the coal found in the gas produced from it. This diagram is reproduced (fig. 8.)

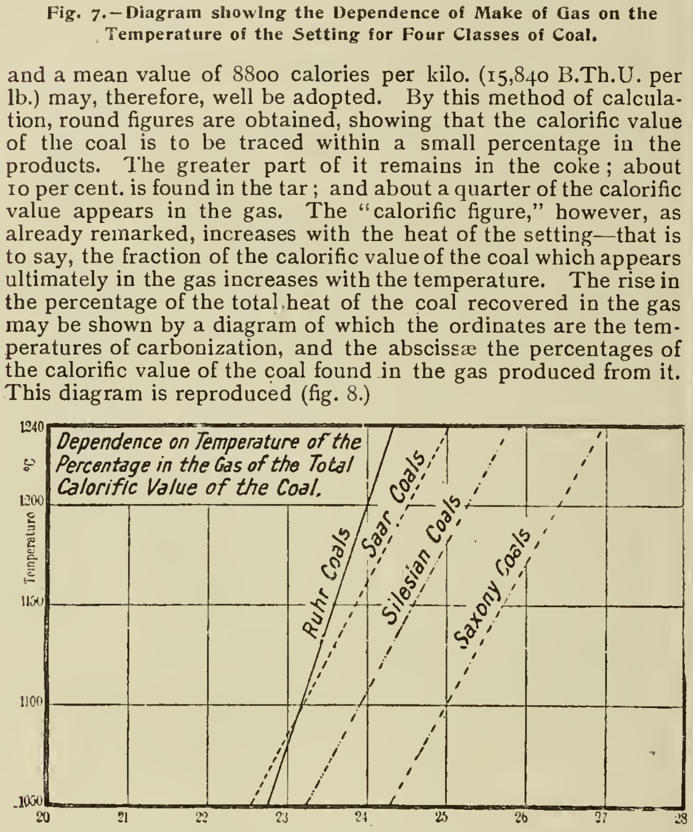


Fig. 8.—Diagram showing the Dependence of the Proportion of the Calorific Value of the Coal Found in the Gas on the Temperature of the Setting, for Four Classes of Coal.

Here again, as in the case of the make of gas per ton of coal, it will be seen that the lines for the different classes of coal are very similar; and it may be said broadly that a rise of temperature of 50° C. corresponds approximately with an increase in the heating value obtained in the gas of about ⅗ per cent. of the calorific value of the gas. If the gas is valued at about 3s. 6d. per 1000 cubic feet, the calorific value of a cubic foot being about 530 B.Th.U., and the coke is valued at 20s. per ton, and assumed to have a calorific value of 14,400 B.Th.U. per lb., it will be seen that the value of the heating power obtained in the gas is about ten times as great as that of the heating power left in the coke. The value of a gas coal which in other respects—such as the quality of the coke—fulfils requirements is therefore dependent closely on the calorific power of the raw material, and, *cæteris paribus*, may be judged by the proportion of that calorific value which is evolved in the form of gas.

Hamburg Coal-Conveying Plant.—It has been definitely decided to enlarge the extensive coal-conveying plant in the gas-works, Grasbrook, Hamburg, by increasing the number of shore cranes, which have each a capacity of 75 to 100 tons per hour, by adding two new ones of the same type. The traffic between the quay, storing-shed, crusher-plant, and retort-house will be handled by means of a telpher line combined with chain bucket conveyors. The whole contract has been entrusted to the firm of Adolf Bleichert and Co., of Leipzig.

The Volcanic Origin of Coal.—We have received from Messrs. Robert Banks and Son, of Racquet Court, Fleet Street, a pamphlet on "The Volcanic Origin of Coal and Modern Geological Theories," by Colonel A. T. Fraser (late R.E.). The author puts forward a plea for lessening demands on geological time, and for further separating the life histories of the aqueous and volcanic formations. He considers it of the utmost importance that coal should be shown to be an old volcanic product, because he says it must lead, in spite of opposition, to finding that many old series of strata the world over are, after all, due to seismic forces rather than to slow aqueous deposition. The price of the pamphlet is 6d. net.

ANNUAL MEETING OF THE ITALIAN GAS SOCIETY.

The Thirty-Eighth Annual Meeting of the Italian Gas Society took place at Venice from June 7 to 10. The year's President was Cap. Vittorio Calzavara, the Editor of our contemporary "Il Gaz," from which official organ of the "Associazione dei Gasisti Italiani" we extract the following short particulars of what was evidently a pleasant and successful gathering.

Out of 140 members of the Society, about 90 were present; representing gas undertakings throughout Italy, from Genoa to Palermo, and from Taranto to Udine. Twenty-seven new members were elected. Representatives of the Prefect, the Syndic, the Chamber of Commerce, and others were also present at the opening meeting, and expressed their welcome to the Society. Sig. Cap. Domenico Gavagnin, of the Chamber of Commerce, spoke of the importance of the gas industry, not only in regard to lighting and heating, but also as to its help to many industries in providing the motive power. The Syndic Grimani said that his Council had endeavoured to improve and extend the gas undertaking in the city, and asked only that gas should be cheap. Sig. Laeng, the Secretary of the Society, recorded the loss sustained by the death of Sig. Cav. Ruggeri, who, as the Gas Manager at Messina, it will be remembered, was one of the victims in the terrible disaster to that city last December. By application to study, he had raised himself from the position of clerk to that of Manager. The eighth list of Italian subscriptions for the sufferers by the Messina and Reggio-Calabria earthquake reaches the total of lire 8875, or about £355. It was decided to erect quite a simple memorial on the grave of Sig. Ruggeri. The sudden death of Ing. Edoardo Baud (who had established and represented in Italy a Lyons firm of retort builders, &c., and whose genial friendliness and generosity were known to, and appreciated by, many) was also alluded to.

Among the technical contributions, Sig. Colombo Cristoforo, of Turin, read a paper on "Regenerative Furnaces Heated by Tar,"* which gave rise to an interesting discussion between Sigg. Sospisio and Romolo De Bartolomeis on the method of regulating the air in producers.

A letter from the Société Technique du Gaz was read on the question of the methods adopted in France for analyzing gas coals. Arising out of this, Sig. Laeng inquired whether it would not be possible to constitute a special fund for the importation from England of coal for small gas-works which were unable themselves to purchase directly. Several members spoke on this, but the conclusion was that it was not possible, as all the vendors protected themselves behind the "certificate of origin." Cap. Calzavara observed, however, that claims could be made on the suppliers who guaranteed the make in gas, coke, and amount of sulphur. Other matters raised related to legal affairs, the standardization of threads, mutual benefit funds, and the like.

Cap. Calzavara opened his presidential address with a reference to his having to occupy the position of President, as Sig. Ing. Verneau, the Manager of the Venice Gas Company, having recently come to Italy from Bucharest and Tours, was not previously a member of the Society, and so could not fill the presidential chair. The President passed on to refer to legislative changes and proposals affecting the gas industry in Italy; and he then proceeded to call attention to what he regarded as a serious danger to the industry—namely, the neglect of the study of gas by chemists, and the general ignorance of the public in regard to it. Illustrations of this ignorance were given; and Cap. Calzavara advocated following the example of England, "where in every town lighted by gas, useful public gas exhibitions are held, showing apparatus for the production, purifying, regulating, and distribution of gas, and with practical demonstrations illustrating the use and convenience of gas burners and cookers, and enforcing the lesson of their economy by comparison with other systems." In Germany, schools for gas-fitters have been established in the principal cities; but in Italy much is to be desired. The President's suggestion was that their Society should, in combination with different gas-works, arrange to follow such instructive examples, which developed gas in a way that seemed to them to be almost incredible. Both the public and the gas industry would benefit in consequence. The former would then have more faith in the latter, which would have itself greater security. Municipalization of public services would be looked at in a different light, and its economical effect better appreciated.

In conclusion, the President reminded them that in 1911 would be celebrated the fiftieth anniversary of a famous period in Italian history; and that, in commemoration, Sig. Cav. Beria, of the Consumers' Company of Turin, had invited them, that year, to hold their meeting in that "cradle of liberty." Further, there would be a national competition open to all gasworkers resident in Italy, and to all members of the Italian Gas Society, the prizes offered amounting to lire 3000 (£120).

The address was greatly appreciated and loudly applauded by the members.

* See p. 252.

The late Mr. John Spencer Phillips, the Chairman of the Shrewsbury Gas Company and of Lloyds Bank, Limited, whose death was recorded in the "Journal" for the 8th ult., left estate of the gross value of £154,550.

COLLEGE GRADUATES AND GAS ASSOCIATIONS.

From an American Correspondent.

This is the time of the year when the annual "crop" of college graduates issues from our many institutions of learning. For those technically educated, the demand fully keeps pace with the supply, except in times of severe business depression. Two years ago, an entire class of about one hundred graduates—comprising mechanical, civil, and mining engineers and chemists—had secured positions available immediately upon graduation, at an average monthly salary of $70. This instance was not an exceptional case, but quite typical of many technical colleges. The standard entering salary paid to all college graduates by one gas company is $60 monthly, while a large telephone company pays $65.

As a result of this demand, the large corporations seeking college trained men, generally make inquiries for men each year in the late winter or early spring. One of our large gas companies, for instance, will at that time write to the Professors of Mechanical Engineering at three or four colleges, stating that there will be vacancies for two or three graduates, and asking that any men they can recommend, and who think favourably of gas engineering, be told to ask for an interview. In this way, the company employs each June about nine men—this number representing three-fourths of all the college men employed each year. Experience has proved that better men are thus secured than by hiring men at intervals throughout the year just as vacancies occur. Each year, the recommendation of a professor means more, because it is now becoming something of a custom in each engineering course to keep a careful record of every student throughout his entire college life, in regard to qualities not disclosed by his capacity for study.

It will be noted above that the gas company quoted selects mechanical engineers. Until very recently, civil or electrical engineers also were occasionally employed, though not sought after; but now only mechanical engineers are taken. If there was here a course having a Livesey Professor of Gas Engineering and Fuel, it would naturally be preferred. So far, however, in this country, no attempt has been made by any institution of learning to offer a course in gas engineering, though the Stevens Institute, which grants but one degree—that of Mechanical Engineer—and which numbers among its graduates some of our best-known gas engineers, has undoubtedly striven to adapt its course as far as possible to meet the needs of the gas industry. Nor has the gas industry done anything to influence the course of study. The one exception is the Michigan Gas Association, which supports a "Fellowship in Gas Engineering" at the University of Michigan. Apparently the engineering courses, as they now exist, meet adequately enough the needs of the gas companies, and certainly advancement comes fast to some of the young graduates. Yearly salaries of $2000 within three or four years after beginning work are not uncommon. The young men of this country never had any cause to complain of the opportunity offered them for advancement; and in recent years, and to college trained men, such opportunities have never been excelled. The youth of twenty-one, who has just graduated from a technical school with anything like an average record, can always find a job. On the other hand, the man who after five to ten years of effort finds his occupation gone, and is forced to apply among strangers, and perhaps for a new line of work, discovers there is no door open except at the bottom; and even this is often shut to him because of the age difference.

This is also a time of Association meetings, though in truth there are now so many District, or State, Gas Associations that every month witnesses one or more meetings. To the "traders," who for business reasons feel compelled to attend most of these gatherings, they must seem of much too frequent occurrence. The National Electric Light Association, which represents the electric lighting industry, has just concluded a highly successful meeting at Atlantic City. This year has witnessed an increase in its membership from 1500 to 3500—a wonderful expansion due to the hearty co-operation of many workers in a vigorous membership campaign. The present number is about equal to one member for every electric light company in the country; while the American Gas Institute, with 1300 on its roll, has rather more than one member for every gas company. The Institute, however, while being a rather better representative of the gas industry, in point of numbers, than is the National Electric Light Association of the electric lighting field, would do well speedily to imitate the latter organization in the matter of a diversified programme of papers. A perusal of the contents of the three volumes of the Institute's proceedings discloses a lamentable disparity between the attention given to the commercial side of the gas business by the Institute as compared with the time spent on these same commercial questions by the average Institute men in their daily work. As a natural consequence, such Institute members are more inclined year after year to join the National Commercial Gas Association, which specializes on all commercial questions. Its existence, however, as an organization distinct from the Institute is a mistake, and will inevitably mean waste of time and effort. For instance, both the Commercial Association and the Institute are preparing to attempt the standardization of gas-cooking appliances. Any lack of agreement between the two Associations would inevitably result in no progress towards standardization; and yet such lack of agreement is rather to be expected. Of course, the remedy lies in the affiliation of the Commercial Association with the Gas Institute; but the latter does not see fit to take any steps in this direction. It seems to be a case of "Wanted—a Leader."

ELECTRICITY FOR EVERYBODY.*

"Electricity for Everybody." This is a title that breathes of ambition and hope. In a circular accompanying the copy of the book sent for review, it is stated that the latter "has attracted considerable attention on account of its unique and original arrangement." We can quite believe the "unique" part of the statement, but the term "original" is not altogether an apposite one as applied to the material of which the arrangement consists. We are also informed that the book "fills a place that no other book has yet attempted to occupy." We also believe that; and it is hoped that no other author will be so foolish as to give publicity to many of the statements contained in this compilation. "Electricity for everybody!" This looks bad for the gas industry; and yet the author—Mr. R. Borlase Matthews—is not really a bad sort, for he does leave the gas industry a bit, and is quite content to let it go starving on with a remnant of business. "It does not require a very great enthusiast now," he loftily observes, "to prophesy that the time will undoubtedly soon be here when about 75 per cent. of the buildings in every city and town will be wired for some application or other of electric light or power." This looks good for the electricity supply industry, whose fortunes, as expressed by dividends, have been flagging of late years. But there must be thankfulness for small mercies. "Gas," we read, "will never be entirely ousted from the field it has held so long. It is against natural laws that it should be; for no one thing can ever be a panacea for all ills." We do not know what Mr. Matthews means; but we suppose it may be accepted as all right—more especially as practically the same statement appears on pp. 83 and 236 of the book.

In his preface, Mr. Matthews says: "It is believed that this is the first attempt to deal with the question from an impartial standpoint." This gentleman has a strange way of showing his "impartiality;" and it is a way that is not approved by us. We cannot therefore recommend his book to any but gas engineers and managers who desire a little entertainment by reading up such sections as "Gas and Electricity Compared," and "Arguments" (for Electrical Canvassers) "against Gas." Where Mr. Matthews confines himself to electricity, there is not much about which to complain. But his partizanship runs riot among facts; and in the parts in which gas is brought under consideration, we accuse him of being either ignorant of his subject, or guilty of fabrication and omission, and of making use of antiquated statements that have since been disproved, and do not apply to the present. Probably he screens himself from all this behind the words in his preface: "In a work of this character, it is almost inevitable that some errors should have crept in; and information as to any such errata that may be discovered would be gratefully received, and also any suggestions for the improvement of future editions." For a fee, we shall be most happy to correct the many errata that have been discovered, and to make "improvements" in any future editions. It would, however, mean the sacrifice of several pages of invective and (to-day) inapplicable statement; and such an amount of revision in other parts that the book in places would scarcely be recognized.

If half that the author says about gas is true, the gas industry would be extinct before many more months passed over our heads. He makes all the hoary allegations about the noxious effects of gas on health, fabrics, book bindings, ceilings, and wall papers; he even piles up the heap of iniquity by charging gas with ruining the polish on the furniture. The sins of gas appear to thrive under the tender and encouraging culture of the electrician; but with all the assumed faults of gas, the public love it still. This is strange, because every virtue (according to Mr. Matthews) is on the side of electricity. It is as cheap as, if not cheaper than, gas lighting; it does no damage; there is no risk of fire about it; it is under perfect control; it is reliable, being practically never out of order; and, in short, it is the most remarkably perfect convenience upon which human endeavour has ever been expended. Concerning costs, we have so frequently dealt with these that Mr. Matthews will know we are not in agreement with him; concerning failures and fires occasioned by electricity, we will, to be as brief as possible, refer him to the "Journal" for Jan. 5. last (p. 35) and various issues since then—especially April 6 (p. 13). We have only just been reading, too, about the fire at the Dundee electricity station. Of course, there is no risk about electricity. Later in the book, Mr. Matthews observes: "Facts are stubborn things—the London County Council Fire Brigade Committee, in their report of the causes of the 3400 fires which occurred during the year, speak of none as being caused by electricity in any form." Mr. Matthews appears to be careless. In 1908, there are to be counted in the report 102 fires traceable to electricity; in 1907, 97; and in 1906, 105. As to dirty ceilings, and the tortious effects of burning gas, we would ask him to give due credit to modern incandescent gas-burners, and dismiss from his mind the effete wasteful flat-flame burner, which consumed gas in a crude fashion compared with the present.

* "Electricity for Everybody." By R. Borlase Matthews, Assoc.M. Inst.C.E., Assoc.M.Inst.E.E. London: Electrical Press, Limited; 1909.

The author gives an account running back to 1877 and ending at 1897 of the cost of decorating a house (it had not been done up for several years prior to 1877), and finds it works out to the awful sum of £5 a year for the twenty years—of course, through using gas. We should have thought it would have come to more, seeing that during the greater part of this period flat flames were in use and not bunsen burners. Is such quotation in 1909 fair play? It does not appeal to us as such. Regarding the electricity meter, we are told that "it is wonderful how accurate is the ordinary electricity meter used to measure the supply to consumers' premises. It is very far ahead in accuracy and reliability of all other forms of commercial measuring devices, such as gas-meters." Official statistics do not confirm the statement; and only the other week the "Electrical Review" was saying: "It is perhaps a fact that need not be too freely advertised that electricity meters do occasionally go wrong, and require replacement. . . . Many supply authorities now make a practice of regularly changing the meter attached to any consumer's supply at intervals of (say) three years." There are many errata to be corrected.

Passing on, it is found that notwithstanding the deadly effects of gas lighting, Mr. Matthews recommends that "if the house is already equipped with gas, it may be wiser to only equip [with electricity?] the living rooms at first, as then the capital outlay will not be so great." He ought to be ashamed of himself for suggesting that people should have a polluted atmosphere in any room, such as they have been thriving on for many a year now. There is no surprise, however, in the recommendation, seeing that the author is in favour of the steel-conduit system of wiring, and ordinary screw socket joint steel conduit costs 16s. 6d. per point to instal. Shopkeepers and housekeepers when they compare Mr. Matthews's assertions with their own experiences will smile hugely at the amount of foolishness and exaggeration there is in this book. The hundreds of thousands of shopkeepers in this country who use gas ought, we gather, to have been irretrievably ruined, by the spoiling of their wares; and mortality among their assistants—or rather the drapers' assistants—ought to have been great, inasmuch as their "strength is sapped by the fumes of gas." We are said to be a nation of shopkeepers, and so poor old England ought surely to have gone by the board long since—and all through using gas. As to the "main question" of efficiency in shoplighting, "electricity is far ahead of gas, since for effective display far more light is necessary than a gas installation can give." Why is far more light necessary than a gas installation can give? and what is the limit that Mr. Matthews puts on the lighting capacity of a gas installation?

In his calculations as to cost for shop lighting, the author gives a consumption of 17 units per annum for an 8-candle power carbon filament lamp, or one-third of this for a tungsten lamp of equal candle power. Taking this basis, with which he furnishes the shopkeeper to calculate his illumination expenses, he only allows 530 lighting hours per annum. Supposing the shopkeeper uses his light for 30 hours a week for thirteen weeks during the winter, that will absorb 390 hours; and leave 140 hours for the remainder of the year, or 3·6 hours per week! But although as the basis of calculation, he only permits 530 hours' lighting, the author later on gives a table (which table has been printed in the various editions of our own "Newbigging's Gas Manager's Handbook" since 1870) showing the approximate hours of lighting throughout the year; and there it is seen that lighting up from dusk to 8 p.m. all the year round represents 759 hours, and dusk to nine o'clock 1078 hours. Though we deduct Sundays from these figures, there is the week-end late night shop lighting to add. In view of these figures, what becomes of Mr. Matthews's other basis of calculation? We suggest to shopkeepers that they should be very chary about adopting these figures as any reliable guide. The author likewise gives for estimating purpose by householders an average figure of 7·7 units as the consumption for an 8-candle power carbon filament lamp, or one-third of this for a metallic filament lamp. Work this out; and it is found that only 240 hours' lighting a year are allowed, which, divided by 52, means less than five hours' lighting per week. His table, or rather Newbigging's table, indicates that the hours of use of artificial light in a year from dusk to eleven number 1808. Therefore, what is the good of giving such numbers of units as Mr. Matthews has done for computations by consumers? They are altogether contradictory to the number of lighting hours in a shop or in an ordinary well-lighted dwelling-house. For the latter, Mr. Matthews prescribes a sort of semi-darkness as being good enough in the hours when artificial lighting is required. This is the old ruse of electricians to get the consumer's electric lighting account down somewhere in the region of the consumer's account who uses gas for lighting only. "Eight-candle power lamps are," he advises, "quite good enough for ordinary continuous use, providing the light is not obscured by too ornate shades; for intermittent use in corridors, cellars, lavatories, &c., a 5 or even a 3 candle lamp is quite sufficient, and consumes less current." A plentiful supply of switches are also recommended, as being a means to economy. The ease of switching-off happens to represent the ease of switching on; and herein is found a fruitful cause of much waste of electricity. Familiarity breeds not only contempt, but indifference. Under the conditions of an economy of light and the ease of switching-off, "if the new metallic filament lamps are adopted, the bills *should be* much less" than those for gas.

As to metallic filament lamps, the author does not regard them as being altogether without fault or blemish. He points to the high units for use on common voltages, to the price, and to the necessity for "matching them up when put in place, and re-paired after every few months' use." He points to this again later in the book: "The lamps should be rematched every few months if the maximum length of life is to be obtained." He therefore regards this as an important feature; and it is seen that 750-800 hours is the average life he accords to the new lamps. But "it is the fragility of the metallic lamps that is perhaps their greatest drawback;" and "owing to the extreme brightness of the higher candle-power lamps, complaints are sure to arise to the effect that the eyes of the user are strained." In another place, he says that 100-candle power naked filament lamps "at short range may be painful and even dangerous." Though further on, to negative the damaging effect of electric light on the eye, Mr. Matthews quotes an unknown writer in the "Philadelphia Medical Journal" whose authority is an unknown Russian observer. This is rather round-about authority; but it suits Mr. Matthews.

In the chapter in which Mr. Matthews brings gas and electric light into closer comparison, he eschews almost everything that is modern in connection with gas lighting. Without offering anything to prove his assertion, he airily says that "experience shows that electricity at 5d. per unit is cheaper than gas at 3s. per 1000 cubic feet." Such dogmatic assertion is not enough. There is disingenuity all through the piece. On the following page, our author gives a table showing the equivalent price of gas to prices per unit of electricity—crediting gas with 2 candles per cubic foot of gas consumed per hour! That is from the old flat-flame days. But he has omitted a similar statement showing the corresponding figure for gas used with the newest forms of ordinary inverted burner, giving 20 to 25 candles per cubic foot of gas consumed per hour. Why is this? He says he is "impartial." In dealing with the heating of a room by gas, he remarks that "the consumption of gas only produces about 700 heat units. We would suggest that he should be more explicit by stating how much gas consumption this represents. There is a considerable amount in the book about the so-called vitiation of air by gas. But we cannot trace any part in which he deals with any other form of burner in this respect than the old flat-flame burner. Is this just? The lower consumption incandescent (bunsen) burner is left out of calculation. He quotes from several ancient manuscripts in this connection, but no modern ones. One is by Dr. Meynott Tidy—in his day known as Dr. Meymott Tidy. Many summers and winters have passed over the grave of Dr. Tidy; and since he published those figures the incandescent burner has come among us, and much has been done towards improving the efficiency of gas for lighting purposes. Fancy a book published in 1909 having to rely upon ancient writings of this kind, prepared under a condition of things that does not exist at the present time. But for more on this point, see "JOURNAL" for Sept. 1 last (pp. 566-7), and April 6 (p. 20).

The author tries to enlighten the world with reference to the constituents of gas. His knowledge is lamentably deficient. He remarks: "In addition to oil gas, water gas *or* carbon monoxide is now added to the product of a 'modern' gas-works." That is altogether wrong. Modern gas-works long since dropped oil-gas enrichment. Water gas is not carbon monoxide. As a constituent of water gas, carbon monoxide represents about 30 per cent.; and in the mixture of coal and water gas sent out, as a rule, only 20 to 30 per cent. of the total is water gas. That is a far different thing. As to the toxic effects of water gas, we see that the "Daily Mail" is Mr. Matthews's authority.

The author also refers to an old statement by Mr. L'ce. Fletcher, the Managing-Director of the Welsbach Company, on inverted gas-burners, which burners did not at one time appeal strongly to him. Times have changed. The burner has been improved; and at the last meeting of the Welsbach Company, the Chairman (the Right Hon. Lord Weardale) said that "the constantly growing inverted mantle business was bound to be a great factor in the future situation." There is one place in the book in which Mr. Matthews admits that "a very marked improvement in recent production is the inverted gas-mantle." But he goes on to say: "This is of about 30-candle power, when new." What does he mean? Which size mantle is he talking about; and what is the consumption of gas? His statement in this respect is a fair sample of the looseness, the inaccuracy, the ignorance, or the wilful misrepresentation (we do not know which it is) that is found throughout in dealing with gas.

Several columns could be written on these matters; but what has already been said will show the unreliable character of the book—at any rate as far as gas is concerned. But we welcome it. While it contains many useful features, on the whole we think, if it gets into the hands of any but technical men, it will do the cause of electricity more harm than good. It should be remembered, in writing a book of this kind, that people will read it in the light of their own experiences with gas; and those who are able to afford electricity among the people not yet captured by it are those who will to a large extent have tried the modern gas-burners and other appliances, and are not ignorant of their efficiency. There is in the book the most modest recognition of the fact that gas has not been standing still the last thirty years. We cannot compliment Mr. Matthews on his performance.

Mr. Samuel Spencer, of Messrs. J. E. & S. Spencer, of Great St. Thomas Apostle, the Chairman of the Colonial Gas Association and one of the Directors of the Croydon Gas Company, has been elected a Governor of St. Thomas's Hospital.

THE RECENT EXAMINATION IN "GAS SUPPLY."

Answers to the Questions Put.

[Third Article.]

Honours Grade Questions.

1. (A) Particulars of the information required in answer to this question accompany Diagram No. 1. [*39.*]

Notes: (1). The position of the wash-boiler is determined particularly by the position of the doors, windows, and convenience for the outlet flue.

(2). The position of the water-heater is determined in relation to its convenience for connecting to the hot and cold water supplies.

(3). Usually a condensing gas-fire is most suitable for heating where flues are impossible, but the area of the hall in this case is somewhat restricted, and a flueless radiator is preferable, in order to avoid risks of the flames catching the clothing of the people passing. Although it would be better fixed nearer the door, it is hardly possible to do this, owing to the draughts which the latter would set up in opening and closing.

(4). In bedroom No. 1 there is no flue; and the condensing fire should have its outlet for the products extended to the outer atmosphere with a piece of galvanized iron tubing, having a suitable attachment to prevent back-draught and provision for running off the condensation products.

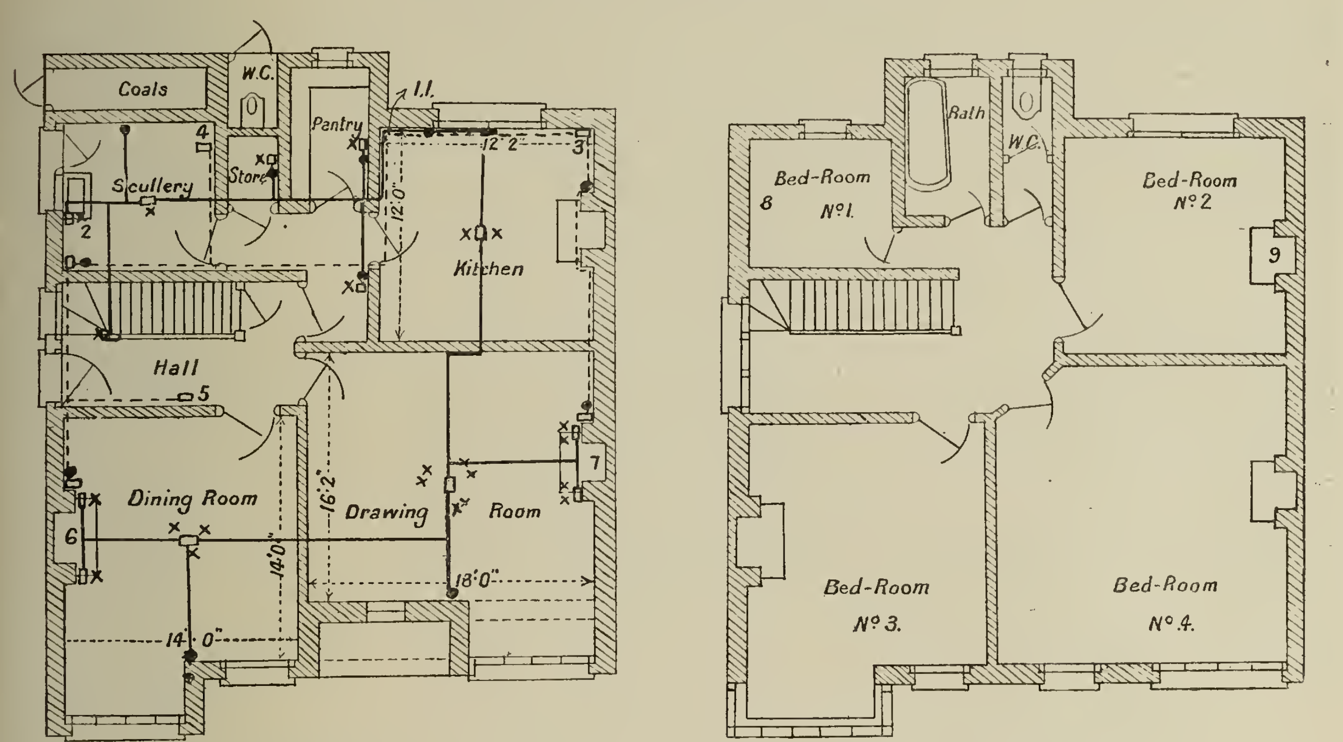
(5). The fires in bedroom No. 2 and the dining and drawing rooms would be connected to the coal-fire flue in an approved manner. (See answer to question No. 10.)

1. (B) See Diagram No. 1. [*39.*]

Specification.—Carcassing.

Heating.—The following are the sizes of piping: A short piece of 1¼-inch pipe is to be soldered to the meter outlet. From this a 1-inch riser is to be carried, and ½-inch branch taken

Diagram No. 1.—*Used in Answering Questions 1a and 1b.*



Ground Floor. First Floor.

Height of Rooms, 10 feet. Sizes of Bedrooms correspond to Rooms underneath.

Question 1a.

Indicate positions in which you would fix the following by using the figures opposite each appliance:—

Meter or meters	1.
Wash boiler	2.
Cooker	3.
Circulating water heater	4.
Gas-fire in hall	5.
Do. dining room	6.
Do. drawing room	7.
Do. bedroom No. 1	8.
Do. bedroom No. 2	9.

Insert in the following form the type of gas-fire and consumption of gas you would adopt to be used at 2-inches pressure.

—	Type.	Consumption per Hour.
Hall	Three Loop Radiator.	15 cubic feet.
Dining room	Canopy, or 14 inch Register.	30 ,, or 50 ,,
Drawing room	Such as Wilson's "Blenheim," or Wright's "Empire."	40 ,,
Bedroom No. 1	Condensing fire.	10 ,,
Bedroom No. 2	Wilson's "W.D." or Wright's "Wizard."	15 ,,

Indicate on the drawing the supply pipes in the rooms on the ground floor (thus ▬▬), showing clearly whether the heating appliances are served from the same line of pipes as the lighting appliances according to your preference. (Position of lights on the ground floor must be indicated thus **X**, the position of pipes leading upwards thus ●, and the position of pipe leading downwards thus ■.)

Question 1b.

Give a concise specification for the carcasing—*i.e.*, piping—of the respective rooms for all the lights required and the pipe for 12-gallon wash-boiler, cooker consuming 60 cubic feet per hour, suitable gas-fires in hall, dining room, drawing room and bedrooms Nos. 3 and 4. Fill in below the particulars of the lighting arrangements you would adopt in the following rooms, with types of burners and gas consumption per hour at 2 inches pressure.

—	Lighting Arrangements.	Types of Burners.	Consumption per Hour.
Ground floor—			
Scullery	2 lights	Bracket and pendant, flat flames	10 c. ft.
Store	1 light	Vertical	3½ ,,
Pantry	1 light	,,	3½ ,,
Kitchen	2 lights	Inverted	6 ,,
Hall	1 light	Vertical	4 ,,
Dining room	5 lights	Inverted	15 ,,
Drawing room	10 lights	Bijous	13 ,,
First floor—			
Bedroom No. 1	1 light	Inverted	2½ ,,
Bedroom No. 2	2 lights	,,	6 ,,
Bedroom No. 3	3 lights	,,	9 ,,
Bedroom No. 4	3 lights	,,	9 ,,
Bathroom	1 light	Vertical	4 ,,

Fill in below the approximate delivering capacity of the various sizes of pipes included in specification, assuming 20-feet lengths free from bends:

Sizes of Pipes.	Delivering Capacity.
At 2 inches Pressure.	
¼ inch	10 cubic feet per hour
⅜ ,,	34 ,, ,, ,, ,,
½ ,,	78 ,, ,, ,, ,,
¾ ,,	257 ,, ,, ,, ,,
1 ,,	636 ,, ,, ,, ,,

out to supply the boiler. A $\frac{3}{4}$-inch branch is to be taken from the 1-inch riser to the dining room for the gas-fire. A $\frac{1}{2}$-inch pipe is to be carried from the $\frac{3}{4}$-inch branch for the fire in bedroom No. 3. From this $\frac{3}{4}$-inch pipe, a $\frac{3}{8}$-inch branch is to be taken to the desired position in the hall for the gas-fire. A 1-inch riser is to be carried from the $1\frac{1}{4}$-inch pipe at the meter to the kitchen ceiling, and a $\frac{3}{4}$-inch branch is to be taken to the position indicated for the cooker. The 1-inch riser is to then diminish to $\frac{3}{4}$-inch, and be carried to the position for the fire in bedroom No. 4, from which point a $\frac{1}{2}$-inch branch is to be carried for the fire in the drawing room.

Lighting.—From the branch of the lighting meter, a leading $\frac{1}{2}$-inch pipe is to be carried to supply the lights in the store, scullery, pantry, hall, bedroom No. 1, bathroom, and closet. A leading $\frac{3}{4}$-inch branch is to be carried to supply the lights in the kitchen, drawing room, dining room, and bedrooms Nos. 2, 3, and 4. The position of the lights will be indicated. The leading mains may be diminished and branches carried according to the following schedule: For 1 or 2 lights, $\frac{1}{4}$-inch pipe; for 3 to 5 lights, $\frac{3}{8}$-inch pipe; and for 6 to 10 lights, $\frac{1}{2}$-inch pipe.

General.—All piping except the drops must be left with a fall to drip back into the risers. Sagging must be avoided. All pipes must be of approved strengths, and readily accessible for examination or repairs. Floor boards covering pipes must be screwed and not nailed. All drop pipes must be well secured and perfectly plumb. No dents or kinks will be permitted. All pipes must be firmly secured with hooks, or, when running parallel to joists, trimmers must be used. The joists must not be cut so as to render them unsafe. The position of all appliances is to be indicated by the undersigned (architects). All compo. joints must be made by the blow-pipe. All pipes must be tested on completion. This may be done by capping or plugging all outlets, and pumping air into the system until a pressure equal to 9 inches of water is obtained. The column must stand for 15 minutes without alteration.

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2. Diagram No. 2 indicates the contour of road, distances and sizes of mains laid in the road, which is situated in an outlying district. At point A, a 6-inch gas-main

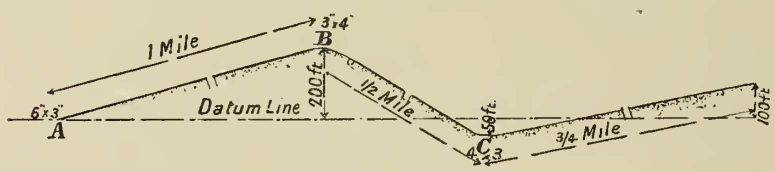

Diagram No. 2.

is joined to a 3-inch main; at point B the size is increased to 4 inches; and at point C it is again reduced to 3 inches. With the minimum draught on the mains the gas pressure at point B is 5 inches; but at maximum draught (for four calendar months in the year) it is reduced to 6-10ths of an inch. For an approximate distance of 300 yards, on either side of point B, the supply is then inadequate for the consumers' requirements. Explain fully two remedies; state which you prefer, and why. The answer must pay due regard to first cost and cost of maintenance. [*39.*]

[It is stated that at B the pressure is 6-10ths of an inch. Thus, taking the rule of 1-10th of an inch drop in pressure for every 10 feet, the pressure at C would be *minus* 19-10ths. It would appear, therefore, that letter B in the second half of the question should be C, and *vice versâ.*]

The most suitable methods for overcoming the deficient supply during the period stated are:

(1). To reinforce the pressure at some point between A and B by pressure-raising machinery.

(2). To replace the 3-inch main (or a portion of it) from A to B by a larger size.

The accompanying sketch (fig. 21) shows a pressure-raising plant which may be put down on the main A B in close proximity to A.

A are the valves which completely shut off the pressure raiser. B is a valve which shuts automatically when the plant starts, and opens when the plant stops or anything goes wrong. C is a governor on the inlet which prevents pressure in the supply main falling below a given limit. D is a governor placed on the

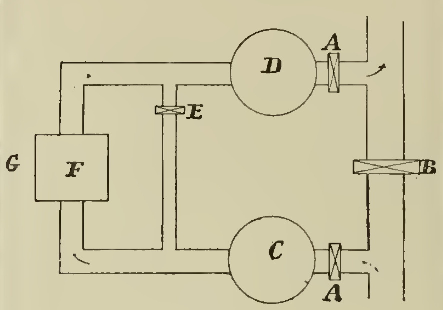

Fig. 21.

outlet which maintains any desired pressure in the delivery main. E is a relief valve, which opens if an excess quantity of gas is passing through the plant. F is the blower. G is the position of the gas-engine which drives the blower.

Referring to the alternative method of relaying the main, the conclusion arrived at with respect to the nature of the district, judging from the sizes of the existing mains, is that it is a small residential one.

To give an ample supply for all seasons of the year, and bearing in mind that the consumption in the district may increase, the best method is to continue the 6-inch main from point A to point C, and fix a district governor at some point between A and B; so that at the minimum demand the pressure, which would otherwise be excessive, could be checked. The points which determine the method to be employed are:

(1). The liability of the consumption to increase and the likely rate of such increase.

(2). Costs, first and maintenance.

(3). That the deficient supply only occurs for four months in the year.

To relay the main ($1\frac{1}{2}$ miles) means greater first cost than the booster; being approximately £800 against £125. But the maintenance costs would be comparatively infinitesimal; and the enlarged main would suffice for many future years.

Main-laying costs would largely depend upon the class of thoroughfare to be excavated; and local conditions would greatly determine whether steel or cast-iron mains should be used.

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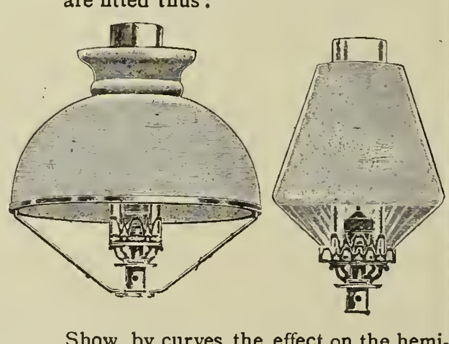
3. (A) To upright burners of the "C" type an opal dome shade and a squat opal shade are fitted thus:



Show by curves the effect on the hemispherical illumination—*i.e.*, throughout a vertical arc of 180°—in each case as compared with the illumination given by the respective burners *minus* such glassware. What is the relative effect upon the lower hemispherical intensity of (*a*) glass shades, and (*b*) metal ring and rods when used for the purpose of carrying reflectors? [*39.*]

The use of a metal ring and rods for supporting the shades shown results in a drop in the illuminating power at such an angle to the horizontal as would be made by a line joining the ring to the centre of the mantle (this is illustrated in the curve). Using shades with metal ring and rods for support increases the lower hemispherical intensity by 50 per cent.—that is, of course, compared with no reflector at all. In the case of glass shades for support, the lower hemispherical intensity is not increased at

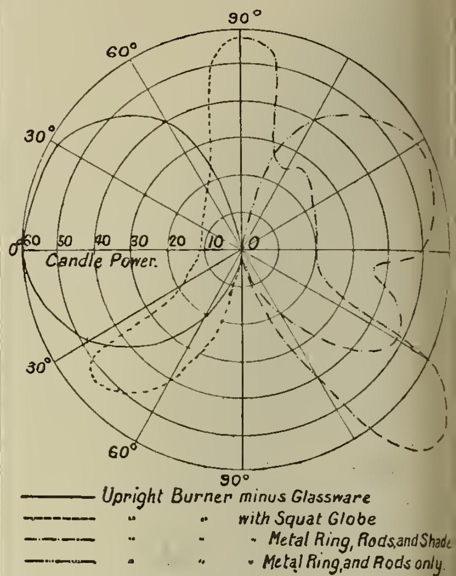


Fig. 3a.

all—in fact, a decrease is noticeable (as shown in the curve). The object in modern illumination is usually to get as much light as possible in the lower hemisphere. Therefore, metal ring, rods, and reflector is the more advantageous type.

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3. (B) Plot a light distribution curve of (*a*) any inverted gas-burner with which you are familiar, and (*b*) any filament electric lamp. Explain how the candle power has been ascertained. How may the results at any given angle be modified in the construction of the inverted gas-burner? [*39.*]

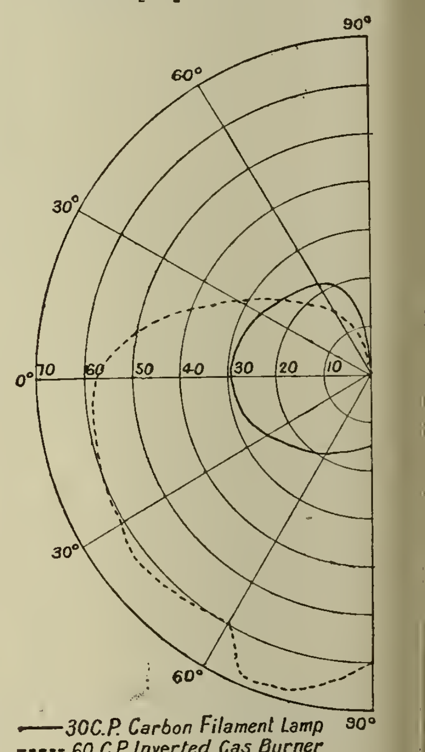


Fig. 3b.

The spherical candle power has been ascertained by using an apparatus similar to the one employed by Professor Drehschmit in his tests. This consists of a mirror set at an angle of 45°, which is set on a revolvable axle. The latter is firmly attached to a parallelogram built up of rods. To one angle of this is firmly attached the arrangement which supports the burner. This device is fixed so that when the parallelogram is rotated it retains a vertical position. The light which falls upon the mirror at any angle is reflected horizontally; the angle being determined by the position of the parallelogram. If the apparatus is set so that the light rays will be reflected in the direction of the photometer bar, the candle power at any angle in the sphere can be determined. The results may be modified at any angle by the use of shades, globes, reflectors, &c. Opal globes reduce the intensity at all angles in the sphere. Shades, as in

)uestion No. 3 (A), increase the intensity at ertain angles in the lower hemisphere, and ecrease the intensity in the upper hemisphere. Reflectors increase the intensity at angles within certain zone, according to the angle which he sides of the reflector form. Half opal lobes increase the intensity in the hemisphere ubtending the clear glass portion of the globe, nd in the other hemisphere a decrease is oticeable.

. State the guiding principles of good schoolroom illumination. A schoolroom 20 feet wide, 30 feet long, and 12½ feet high, contains separate desks for twelve students and a teacher. The desks are 2½ feet high. What lighting arrangements would you employ so as to maintain an approximately even illumination of 2·5 foot-candles on each desk surface, and what would be the number, candle power, and height from floor level of the light units employed? A simple sketch in plan must be used to show the relative position of desks and lights in the system adopted.

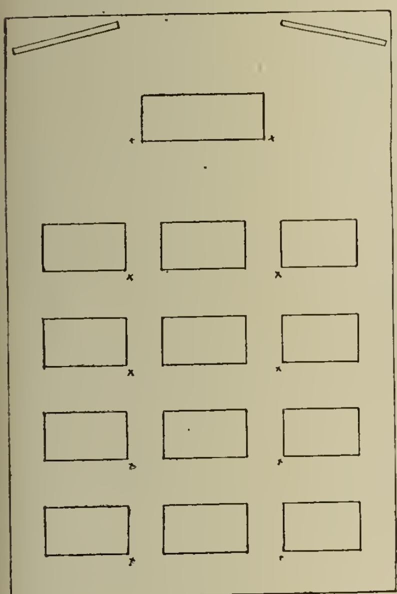


Fig. 22.

The point of greatest importance in schoolroom illumination is that eye-strain should be entirely avoided. Light sources should be placed out of the usual line of vision. Their intrinsic brilliancy should be such that, even when brought into the line of vision, injurious effects will not result therefrom. A good factor to work to is not to exceed 5 candles per square inch of light source. Thus, a mantle of the "Nico" type, with a visible area of 1½ square inches, and giving 80 candles, would require a globe of such an area as to reduce the light from 54 per square inch of mantle to 5 candles per square inch of visible globe surface. Such a globe, however, must not be closed at the base, or it will be difficult to obtain 2·5 candles upon the students' desks without either increasing the number of lights or bringing them too near the floor level. The light source should be so arranged that the dominant shadows are thrown, as far as possible, from left to right of the pupil's desk. Enamel reflectors may also be employed with advantage, since they improve the diffusion; and a suitable reflector will increase the downward illumination 25 per cent. Lights of a comparatively low candle power are preferable to a smaller number of high candle power; but, on the other hand, the cost of fitting up the schoolroom is increased, and the greater the number of burners to maintain the greater will be the aggregate cost of maintenance. The desks are 2½ feet high. A burner giving an effective illumination in a downward direction of 100 candles would require to be placed 6 feet above the desk surface to obtain 2·77 foot-candles illumination on the latter. Thus,

$$6^2 = 36. \quad 100 \div 36 = 2{\cdot}77.$$

This is a little more than is required in the question. If inverted burners with reflector shades are used—say, of the Graetzin type—100 effective candle power will be obtained downwards. The lights should be placed 8½ feet from the floor level; and in this position the illumination required will approximately be obtained, since a certain amount of diffused light will fall on to each desk in addition to the point of light most nearly adjacent to it. Separate light units for each desk would more nearly approximate to the conditions above laid down; but a medium must be obtained between such an ideal and the cost of fitting and maintenance. The lights fixed for the blackboard illumination should be placed at such a height as to reduce to a minimum the reflection through the latter upon the size, type, &c., of which this would depend.

5. (A) What is the nature of the damage to gas-mains caused by electrolysis and electric fusion? What are the best preventatives (*a*) in the case of existing gas-mains, and (*b*) in the operation of laying new mains. (*39*.)

Damage to gas-mains by electrolysis varies according to whether the soil is a good or bad conductor of electricity. The nature of the action is a decomposition of the iron, forming ferric or ferrous salts in combination with the soil at the point of damage. [One ampere of electricity will destroy the same amount of iron in a 2-inch as it will in a 6-inch pipe, provided that the soil is the same.] Electrolytic action is different both in cause and effect from fusion. The damage is usually spread over a longer length of main; "pitting" being distinguished by the blue coloration at the point of damage. The coloration, however, disappears on exposure to the atmosphere. Pitting usually occurs at the point or points where the current leaves the rails; but corrosion may occur at the point of entry. More damage occurs from "direct" than from "alternating" currents. Electrolytic action is caused through stray currents from a system of electric traction leaving the car rails, return feeders, &c., and resorting to other sources for their path to the generating station. These currents leave the rails and pass to the main when the intervening soil is a good conductor. If the current comes into contact with a joint of high resistance, the latter is either "jumped" or the current returns to the rails. In either case, pitting will occur at these points—viz., where current leaves the main—and iron salts are formed. This action is always liable to occur where the main is positive to the rails. Electric fusion is the result of an actual electric flame playing upon the pipe and fusing it as with a blow-pipe, owing to the very high temperature attained. The damage is caused by a fault in the insulation of an electric cable. The distinguishing feature is the rounded appearance of the edges of the fused part. The size of the hole depends on (1) intensity of heat; (2) the material of which the main is made; (3) the length of time in which the arc is set up.

Preventives.—Broadly speaking, preventives are of two classes: (1) Those which aim at conveying the current from the pipe without damage by bonding the pipes to the return electrical circuit. (2) Those which aim at making the pipes poor conductors, thus preventing current from entering. A combined modification of both is sometimes employed.

Bonding, as in (1) is dangerous, for it will conduce to more current following the pipe. The current has a tendency to "jump" the joints of cast-iron pipes; and the greater the current passing, the greater the liability to this. The current, too, has a tendency to follow pipes laid in earths of high resistance and leave them in earths of high conductivity, even assuming a pipe of even conductivity.

Theoretically, system No. 2 would be best achieved by using insulating joints, to break the continuity of the pipes as return conductors; also insulating covering. The latter should be moisture-proof, and would therefore be gas-tight as well. In practice, the nearest approach to this ideal is the use of cement coverings and tar mixtures, though the best method yet adopted is casing the pipes in wood.

A survey of the district may be made, and a map drawn up. The positions where the main is positive to the rails should be clearly indicated, and the electrical authorities be urged to keep down the potential of the rails. New mains should be laid as far as possible from the zone of danger, and preferably covered with some material of non-conductivity.

5. (B) What methods may be employed for connecting wrought-iron services to Mannesmann steel mains? Show by sectional sketch the form of joint you would adopt, and give reasons for your preference.

(1) *Helps's Connecting Pieces.*—These consist of a wrought-iron clamp, the top arm of which is bored out to receive a brass connector, having a collar cast on to engage with the clamp. The underneath part of the connector is shaped to fit the outer surface of the pipe.

(2) *Mueller's Saddle Joint.*—This consists of a saddle of malleable iron formed to exactly fit the circumference of the main. On the underside is cast a circular grove to take a lead ring, which, when fixed, makes a gas-tight joint with the pipe. The straps for securing the saddle are made of soft steel.

(3) *The Parkinson Expansion Nipple.*—This consists of a soft steel nipple, which is screwed into the main, and, by means of a sleeve and nut arrangement, a mandril is drawn through it. The nipple has a raised burr on the inside at the bottom, so that when the mandril is passed through it is opened out to the same diameter as the pipe, thus riveting it inside.

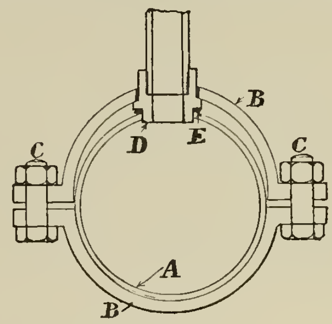


Fig. 23.

(4) Fig. 23 is a sectional elevation of a service connection to a Mannesmann steel main. A is the main, and B are the wrought-iron clamps for holding in position and pressing down the nipple D. Underneath the collar of the nipple D is placed a lead ring E; so that when the bolts C are tightened up, the joint between the main and the nipple is gas-tight. In making the joint, the bottom clamp is put under the main, then on the top the jute covering is cut away sufficient in area to allow the lead ring to lay on the main. The hole is then drilled, the lead ring put in position, and the nipple, to which is screwed a bend with socket and plug at the outer end, is fitted into the main. The top clamp is then passed over the service-pipe on to the collar of the nipple, and tightened up by means of the bolts C.

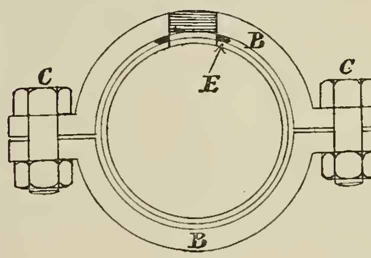


Fig. 24.

(5) In the method shown in fig. 24, no nipple is used. The clamps B are made thicker than in the last example, and the top clamp is drilled and screwed ready to take the service-pipe; the gas-tight joint being made by the lead ring E pressing against the main and the underside of the clamp, by tightening the clamp bolts C.

In making the joint the covering is cut away to receive the lead ring E. The clamps are put around and tightened up to make the gas-tight joint. The hole is then so drilled that the service-pipe, when screwed in, just enters the inside of the main and prevents the clamp from turning.

The fifth method is to be preferred, because it is more quickly made, and with no more escape of gas than in cast-iron pipe servicing. The joint, too, is made before drilling the pipe.

6. Describe a method of automatically lighting and extinguishing street-lamps in which pressure from the distributing governors does not form part of the operation. The appliance described must be adaptable to an inverted burner street-lamp, the method of fixing to which must be fully explained, together with the precautions necessary for efficient working.

Gunning's clockwork automatic lighting apparatus will fulfil the conditions required.

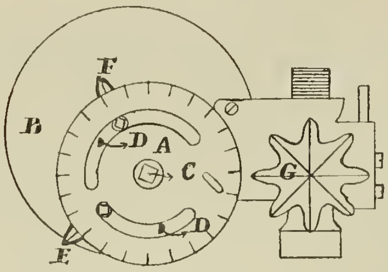


Fig. 25.

The apparatus consists of a case B, which is circular in shape and encloses the clockwork mechanism. The disc A is secured by a small screw to another disc, which is fastened to the axis C of the clock. The latter disc revolves once in 24 hours, and A revolves with it. Two slots D are cut in A, which permit, to a certain extent, the projecting pieces E and F to slide round the periphery of A, which is graduated into 24 equal parts corresponding to the hours of the day. The pieces E and F are firmly secured in the slots to the time of lighting and extinguishing respectively. At lighting time, E engages with a tooth in the wheel G, which opens the gas-way and closes the bye-pass by the action of the eight-way plug H (fig. 28). When F gets round to the wheel G the latter is again turned, and the light is extinguished, immediately previous to which the bye-pass has been ignited.

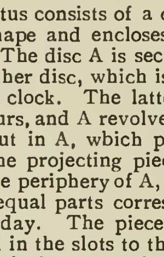


Fig. 26.

Fig. 26 shows the bye-passing arrangemei for continuous or intermittent use. This is ac justed by one of the set-screws shown.

Fig. 27.

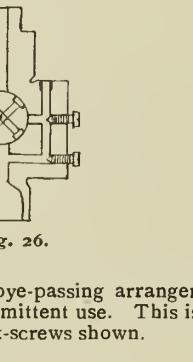


Fig. 28.

Fig. 27 shows the full gas-way. Fig. 28 shows details of the cog-wheel G, and the plug with four ways each for the bye-pass and burner.

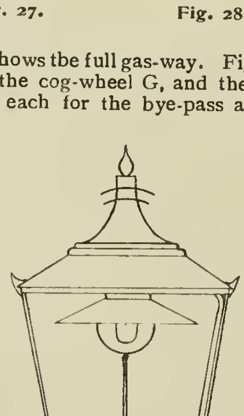


Fig. 29.

Fig. 29 indicates the arrangement for fixing the controller to the lamp service; the best position being immediately underneath the lamp, enclosing the mechanism in the case N and running a suitable bent piece of pipe up one corner of the lantern and across the top. To this pipe the inverted burner is secured. This method results in a minimum obstruction of light.

Precautions.—The apparatus requires winding up once weekly and the position of the projecting pieces altered to suit the times of lighting and extinguishing. A special case, enclosing the controller, minimizes risk of damage through exposure to weather conditions. The apparatus should be occasionally taken out and cleaned, and the plug well lubricated.

7. What purposes do indicator diagrams serve in gas-engine practice? Show diagrams, and explain the effect on the respective curves of (*a*) a contraction in the exhaust pipe, (*b*) preignition, and (*c*) late ignition.

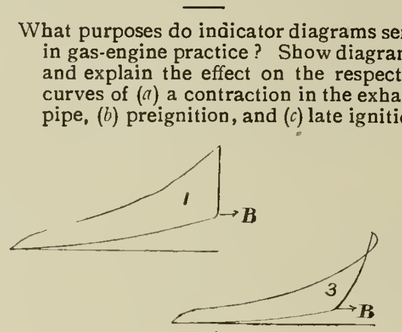


Fig. 30.

Indicator diagrams show if the igniter is properly timed, whether or not the valves open or close at the proper points in the cycle, also whether there is correct compression or not.

In fig. 30, 1 shows a correct diagram with the engine working properly; 2 shows the effect on the curve as would take place in (*a*); 3 shows the effect on the curve as would take place in (*b*); 4 shows the effect on the curve as would take place in (*c*).

In 2, the upper curve M is produced by pressure within the engine cylinder on the exhaust stroke. In 3, ignition takes place as indicated at B, instead of at the point B as shown in 1. In 4, ignition takes place as shown at B.

8. Give a list of the types (not makes) of gas wash-pans or boilers with which you are conversant. To what efficiency tests would you subject them when making a selection, and upon what constructional and other points would your preference for any particular one be determined?

The types of gas wash-pans are: (1) A tinned copper pan with galvanized iron casing; (2), an iron pan made rustless by the Bower-Barff process, having a cast-iron casing and standing on three cast-iron legs; (3), a tinned-copper pan in cast-iron casing supported on cast-iron legs; (4), a tinned-copper pan with galvanized iron casing and packed with slag wool to prevent loss of heat by radiation; (5), ditto, sand packed.

A good test for efficiency is as follows: Weigh or measure (say) 10 gallons of water into a 10-gallon boiler, and take the temperature. Connect the burner of the boiler to the outlet of a test meter and note the index. Ignite the gas and heat the water until boiling point is reached, noting the time taken and the cubic feet of gas consumed. The efficiency is determined as follows: Suppose the initial temperature of the water was 40°. Then $212 - 40 = 172°$ rise in temperature. The weight of water raised is $10 \times 10 = 100$ lbs. The number of B.Th.U. required is 172·00. Say, the gas consumed is 68·8 cubic feet, with a calorific value of 500 B.Th.U. net. The total number of B.Th.U. generated equals 34·400. Therefore the efficiency is $\frac{17\cdot200}{34\cdot400} = 50$ per cent.

The time taken to boil would provide one comparative efficiency test; but cast-iron boilers under such a test would appear more inferior than they really are, for though they take longer to heat up, they retain the heat longer. When comparing cast-iron with copper, it would be better to arrange water inlets and outlets on the lines of a calorimeter; cold water running in at the bottom and hot water out at the top—a mechanical agitator being used to ensure approximate uniform outlet temperature. From the difference in temperature and the volume passed through, the efficiency could be calculated. This would involve specially prepared boilers for testing *only*, with suitable provision for the agitator referred to. The test should not be taken until uniformity of outlet temperature is reached.

Constructional Points.—The metal in the copper boilers should be gauged; and not more than three pieces should be used in the construction of one boiler. The ring burner must be well supported on rests that will not easily corrode, and must have a large number of small holes, with consequent short flames, in preference to large holes and long flames. The burner must be placed so far from the bottom of the boiler that the flame can at no time touch it. The boiler should have a flue communicating with the waste-gas flue from the pan to take away the steam, with a damper to cut off at will. The underneath of the boiler should be open, so that in case of a momentary down-draught the flames do not smother out. The casing must not rest on the floor, or it will quickly corrode.

9. (A) What is the catalytic theory of the luminosity of incandescent mantles? What precautions must be observed in order to obtain the maximum luminosity from a given quantity of gas in a low-pressure burner?

Catalysis indicates a change in composition effected on a body by the mere presence of another which does not undergo any change. Thorium and cerium are both catalytic agents; the latter more so than the former. One well-known authority asserts that the incandescent mantle is a few degrees hotter than the tip of the flame in which it is suspended, and that this clearly indicates catalytic action. Another equally eminent authority claims that the temperature of the mantle is not higher than the hottest portion of the flame, and that selective radiation and not catalysis is responsible for the luminosity of incandescent mantles. It is probable, however, that all three agents—catalysis, selective radiation, and temperature—play their part in producing luminosity. Professor Lewes demonstrated his belief in catalytic action by igniting a mixture of gas and air at the top of a mica chimney fixed above a bunsen burner tube. The mantle was held in the flame of the burning gases, incandescence resulting, and the luminous effect was continued when the mantle was lowered into the chimney—*i.e.*, into the cold ascending current of gas and air.

To obtain the maximum luminosity from a low-pressure burner, (1) the nipple should be fitted perfectly concentric with the bunsen tube; (2) a venturi tube, or similar device, should be used to ensure thorough mixing of the gas and air, to accelerate the flow, and prevent lighting back; (3) the flame should be regulated to fit the mantle; (4) gas and air adjusters should be fixed.

In the case of inverted burners, the precautions necessary, in addition to the beforementioned, are: (1) An arrangement to prevent commingling of the primary air and combustion products; (2) an annular space should be left between the mantle ring and the burner-nozzle; (3) there must also be adequate gas pressure—viz., a minimum of 2 inches.

9. (B) How is the incandescent mantle made? What is its composition, and what is the effect of each component on the functions of the mantle? How would you test a mantle for efficiency and durability?

In the manufacture of the upright incandescent mantle, the first process is the formation of a long cylindrical sleeve, about 2¼ inches in diameter, which is knitted together from cotton or ramie. The sleeve is cut up into lengths of 8 or 9 inches, and the top of each drawn together by a string of asbestos to form the shoulder. A loop of the same material is passed across the top to form the support when fixed on the pin. The mantle is then dipped into a solution containing 99 per cent. and 1 per cent. respectively of the nitrates of thorium and cerium, and passed between rollers to remove excess solution and to ensure that it is evenly distributed. The mantle is moulded by stretching it on a glass or wooden shaping cone, in which state it is allowed to dry. Burning-off is done by suspending the mantle immediately over a high-pressure bunsen flame, through which it is frequently passed until the fibre is burned to ash and the nitrates of thorium and cerium are oxidized. The oxides and fibre fuse together to form the mantle. The final process is immersion in a solution of collodion and nitro-benzene, to strengthen for transport when dry.

Comparison tests for durability of mantles

ıay be made by Woodall and Moon's machine. ı this instrument, the mantle is alternately ghted and extinguished, during which time it subjected to a series of shocks. By adding eights to spindles provided for the purpose, ıe amount of vibration from the shocks may be ıcreased until, if desired, the breaking point is eached. Inspection of a portion from a burned-ff mantle under a microscope will indicate the uality of the mantle—viz., whether cotton or amie—also whether single or double woven. 'arious makes of mantles may be tested against ach other. These are fitted to burners and arefully burned off. After burning (say) half-n-hour, they are extinguished and relighted at -inch pressure, which is gradually increased ntil the best efficiency is reached. The mantles ıay be kept alight (say) 200 hours, and notes aken every ten hours of the candle power, and hether the mantle splits, breaks, or falls off at he shoulder. A graph may then be drawn up howing the various illuminating values every en hours. A table may also be made showing he pressure, cubic feet burnt per hour, candle ower, and candle power per cubic foot. Such tests, to be reliable, should embrace more than one mantle of each make.

10. What are the constructional points to be observed in a gas-fire in order to effectively remove the combustion products? Show by sketch, in sectional elevation, and describe what you consider the best means of conveying the products from the point of combustion to the point of discharge in the chimney of an ordinary fire-place.

To effectually remove the combustion products from a gas-fire, it is essential that the flue pipe leading from same should be large enough to maintain a steady up-draught. The canopy should project from the top of the fire over the fuel so as to prevent any products of combustion from passing into the room. The side cheeks should preferably project forward a little. The products of combustion should be taken off at the highest point in the fire, and the flue tapered towards the top to maintain the velocity of the gases. The best method of conveying the products of combustion from a gas-fire to a coal-fire chimney flue is shown in fig. 31.

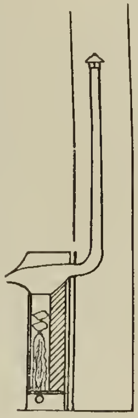


Fig. 31.

It is usual when fixing a gas-fire in front of a coal-fire grate to make up the front of the latter with sheet iron and pass the flue through into the chimney. The flue and its connections are preferably round, in order that the velocity of the products is not impeded. There should be no sharp bends. The flue should extend about 2 ft. 6 in. up the chimney, and be tapered towards the top. The bottom of the outlet cowl should be above the top of flue-pipe end. If the chimney flue is the only means of ventilation, it is desirable that a number of holes be bored in the sheet iron, through which the chimney will draw air from the room, and exert less vacuum on the stove flue-pipe. Excessive vacuum reduces heating efficiency and useful radiant duty.

Concluding Remarks.

Generally speaking, the answers to this year's questions as eproduced in these articles are rather longer than those of last 'ear. An approximate analysis, however, shows that, after allowıg 80 minutes for sketches and "reflections" upon the questions, he speed of the writing in the Ordinary Grade would have to ıe at the rate of 27 words per minute when answering the eight ongest permissible questions and 13 words per minute when ınswering the eight shortest permissible questions—*i.e.*, at the ength here given. The mere physical act of writing the answers, herefore, though strenuous, is not beyond the capacity of the vell-prepared student. The longest answers are usually those ɜntailed by descriptions of appliances; and if the candidate is ɔonversant with the appliances involved, the questions do not ake up very much preliminary thought. In other words, it will usually be found that the questions which can be satisfactorily answered in the least number of words require most thinking about. The physical strain of the former, therefore, so far as the chronological dictator is concerned, is more or less counterbalanced by the mental strain of the latter.

The speed required in writing the eight longest answers as here given in the Honours Grade would, after making the allowance of 80 minutes as above, be at the rate of 21 words per minute, while the speed required in writing the eight shortest answers to permissible questions would be at the rate of 14 words per minute. It is beyond the capacity of any student to answer perfectly in a time-limit examination, without leaving out any item of detail, the whole of the questions to which answers are allowed; but the foregoing answers, in conjunction with those given last year, should afford some assistance to candidates in framing the form of the answers, and in realizing the highest ideal to be aimed at.

NOTES ON WARMING AND VENTILATION.

At a Meeting of the Surveyors' Institution which took place some weeks since, a paper bearing the above title was read by Mr. E. H. Blake, a Fellow of the Institution. The following are the portions of the paper in which readers of the "Journal" are more especially interested.

In his introductory remarks, the author pointed out that in the year 1619 James I. proclaimed against the then general overhanging storeys of houses, and ordered the walls of new buildings to be carried straight up; and twelve years later his successor Charles I. went further, proclaiming the heights of rooms and proportions of windows for the "benefit of ventilation." The continued crowding, however, accompanied by the filthiest of surroundings, caused the carrying off of about 100,000 persons by the plague; while the great fire of London in 1666, which was a "blessing in disguise," did more for the public health in three or four days than hundreds of years of proclamation. New buildings were put up in which crude attempts at sanitation were introduced by Inigo Jones and others; rooms were made larger and loftier, and stairs and passages lighter; fireplaces were put into nearly every room; cellar dwellings were discontinued; streets were paved and drained—in fact, the whole aspect of things was vastly improved according to the best ideas of the time.

Unfortunately, however, continued the author, we still find, in spite of our increased appreciation of sanitary construction, buildings almost as ill-planned and ill-ventilated as those of two or three hundred years ago. Much has been done by legislation in the provision of sufficient air-space around buildings, the prevention of overcrowding, and so forth; and much more can yet be done by legislation in the way of the more skilful planning of towns. But the necessity for ventilation remains. The science of ventilation is closely allied to that of warming, and the two processes are often combined. It will be convenient to deal with the latter first, since rooms are rarely without some means of warming, even though there be no ventilation.

The modern methods of warming consist of open fires, close fires or stoves, hot water, steam, hot air, and electricity. The first mention of "iron grates for burning coal" is found in inventories early in the sixteenth century; and at its end Sir Hugh Platt diminished the depth and width of the hearth recess, and contracted the mouth of the flue. A French architect—Savot—about the year 1624 introduced the perforated base-plate of the ordinary grate, and much reduced the height and width of the fireplace opening. At the beginning of the Nineteenth Century, Count Rumford, the founder of the Royal Institution, did more to improve the fireplace than anyone up to that time. He brought the fire-grate forward, set the mantel lower, emphasized the importance of forming a "throat" to the flue and bringing it well down over the fire, and introduced the diverging sides or covings, to obtain greater radiation of the heat into the room.

Later in the century, valuable experimental work was done in connection with the improvement of fireplaces by Dr. Teale, F.R.S., who embodied his conclusions in a paper, read in 1886 before the Royal Institution, on "The Economy of Fuel in House Fires." The chief conclusion obtained by Dr. Teale was that slow and efficient combustion depends on there being no current of air up through the grate; and he accordingly introduced what is known as the "economizer," shutting in the space below the grate. He also laid down a series of rules for the design of fireplaces, the principal of which are: (1) Use as little iron as possible, making both back and sides of fire-brick; (2) the fire-brick back should lean over the fire—the idea of this being suggested by Rumford but developed by Dr. Teale; and (3) the greatest efficiency is obtained from the covings when they are inclined at an angle of 60° to one another.

Gas-fires are generally considered unsatisfactory, though many improvements have been made to them in recent years. They are apt to cause want of humidity in the air, or at any rate to produce a parched feeling in the throat. There is a great prejudice against the use of close fires or stoves; people say they want to see the fire. Such stoves are apt to get very hot, and they then roast and burn the floating particles of animal and vegetable matter in the air, and give off unpleasant odours. They are liable to decompose the air; and they certainly deprive it of much of its moisture. A close stove also cannot, as a rule, be looked upon as any aid to ventilation like an open fire.

For the warming of buildings by hot water there are two systems available—the low-pressure and high-pressure respectively. The former method is by far the older, having been introduced about the beginning of the Eighteenth Century by a Norwegian gentleman for the purpose of warming a greenhouse. The system was introduced into England by the Marquis de Chabannes, who added the storage cylinder, which he usually placed under the stairs. The water circulates by reason of the heavy cold water descending and forcing the lighter warmer water up. As carried out nowadays, low-pressure hot-water warming is both economical and satisfactory, except for the large diameter of pipe used—usually 3 to 4 inches. The pipes are not sealed as in the case of a high-pressure installation.

The high-pressure system was invented early in the Nineteenth Century by a Mr. Perkins, and was known by his name for some time. It consisted of an endless pipe, part being coiled in a furnace and radiating coils being put where needed. The method of installing it has varied but little since its introduction. The advantages of the system are that the pipes, being smaller than those used in the low-pressure system, are less unsightly, and the water can be sooner heated. On the other hand, the disadvantages are the very high pressure in the pipes, the unequal diffusion of heat (generally due to defective circulation caused by bends, &c.), and the fact that the system requires skilled attention and is liable to scorch the air.

Heating by steam was suggested as far back as the Sixteenth Century. The "Philosophical Transactions" of the Eighteenth Century contain particulars of many proposed methods of steam heating, all of which are very imperfect and dangerous; and it

was not till the opening of the Nineteenth Century that a workable system was installed on very much the same lines as those at present adopted. There are both high and low pressure systems. A steam-heating installation has a life of about twenty-five years; but a hot-water installation is practically indestructible, and costs far less for maintenance. The advantages claimed for a steam installation are: (1) There is less liability of damage by frost than in the case of hot-water pipes; (2) smaller radiators can be used; and (3) rooms can be more quickly warmed and cooled. On the other hand, any form of heating by steam needs skilled attention and close supervision. It has also the disadvantage of scorching the air, and depriving it of much of its moisture.

In recent years, electricity has become more popular as a means of warming; but it is an expensive method. The best form of electric radiator is that containing long bulb lamps. The filament is heated to an orange red, in which state it gives out most heat. The glass cases of the lamps are frosted or ground, to enable them to retain some heat rays, and so assist in warming the air by convection. The use of radiators involves the necessity of duplicate systems of wiring the building, so that the current consumed may be charged on the "power" scale. The system is not so cheap as fires, but is far cleaner, more sanitary, under perfect control, and portable. As to cost, a four-lamp radiator consumes one Board of Trade unit per hour at a cost of from 1d. to 2d. per unit, or ¼d. to ½d. per lamp per hour.

Passing on to deal with the other section of his paper, the author remarked that there are few subjects in a more unsatisfactory state than that of ventilation, or the removal and dilution of the products of combustion and respiration. A large amount of experimental work has been done in recent years; but the problem seems still far from solution. The principal impurities found in the air of rooms are organic matter and carbonic acid gas. The former cannot be accurately or easily estimated, but it is known to be a fairly constant ratio to the latter, which is therefore made the basis of a standard of purity. The proportion of carbonic acid gas in the air of a room should not exceed 0·6 cubic foot in 1000 cubic feet of air. The ordinary air of towns contains about 0·4 cubic foot in 1000; and the average adult is said to give off about 0·6 cubic foot of the gas an hour. At this rate, he will in 20 minutes raise to the allowable limit of impurity 1000 cubic feet of air, and so should be provided with about 3000 cubic feet of air per hour. This is often put in another way, to the effect that he should be given 1000 cubic feet of space, and the air be changed three times an hour. It is not wise to put it this way, as the change of air is more important than the space occupied; and it has been shown that apartments with a large cubic space per head and slow change of air are less healthy than those with less space and more frequent change. In calculating the quantity of air required, each gas-jet or candle can be regarded as equal to one human being in its effect on the purity of the air. In calculating the cubic space, no height above 12 feet should be taken into account.

The essentials of a satisfactory method of ventilation and warming may be summarized thus: (1) Fresh air must be admitted or injected, and the vitiated air allowed to escape, be extracted, or expelled. (2) The quantity of air supplied and the velocity of admission to be under control. (3) The change of air to be thorough; no stagnant corners being left. (4) No draughts to be caused. (5) The incoming air to be clean and humid, and not scorched or deprived of its moisture by defective methods of warming it before admission. (6) The temperature to be uniform and under control. In the author's opinion, there is no system at present which absolutely fulfils these conditions at all times; but he described briefly those in use, and stated their various advantages and disadvantages.

Methods of ventilation can be classified in various ways; for example, there are both upward and downward systems. It is essential that the vitiated air should be extracted while warm, as the carbonic acid gas, when cooled, is heavier than air, and falls to the floor to be re-breathed. Air, as it becomes warm and vitiated, tends to rise, and the air currents from the body also tend upward. This is an assistance to upward, but an obstacle to downward ventilation; necessitating in the latter case the introduction of about three times as much air as is needed, in order to dilute the vitiated air that is sent down to be re-breathed. Gas-jets, &c., assist upward, but are difficult to deal with in downward systems. The latter are also difficult to work satisfactorily in halls having galleries.

Systems of ventilation can be classified as natural and artificial; the two being often combined. In a natural system, inlets are provided through which the fresh air enters without assistance, and outlets through which the vitiated air will escape without it. The objections to the system are that the source of supply of fresh air is not under control; the incoming air is not so readily cleansed and humidified; the volume, temperature, and velocity of the incoming air are not under control; and it is a draughty system. On the other hand, it is simple and inexpensive, costing very little for maintenance; and doors and windows may be quite freely opened without disorganizing the system. The simplest form of artificial or mechanical ventilation is that in which the inlets are as already described; the outlets being assisted as extractors by gas-jets, steam or water jets, hot water or steam coils, electric radiators, or other means of increasing the current through the outlet. Other forms provide for both propulsion and extraction by mechanical means.

Having described in considerable detail the "Plenum" system of ventilation, and given some particulars of another mechanical system, of a distinctly different character, recently introduced by Dr. Glover Lyon, for which many advantages are claimed, the author concluded by explaining that, though there are innumerable patents connected with ventilation, his notes were only intended to treat of the broad principles involved in the more important systems. He added that in testing the ventilation of any building, one could not do better than follow the advice of Dr. Parkes: (1) Find the amount of cubic space and floor space per person; (2) find the number of cubic feet of air per person per hour; and (3) test the air by the senses, and by chemical mechanical, and biological methods. In comparing costs, it was necessary to capitalize the outlay on maintenance, and add it to the initial cost, as the system which seemed the more economical might possibly be the more expensive.

A NEW LONDON SHOW-ROOM AND STORES.

Further Conveniences for Gaslight and Coke Company's Consumers.

Capacious as are the magnificent show-rooms and stores of the Gaslight and Coke Company which are situated in Kensington High Street, a stage was reached some time ago when the enormous amount of business passing through them became somewhat of a tax upon the resources of the establishment; and therefore some distribution of the work was felt to be desirable. In addition to that, the district served by this depôt was a very extensive one; and it was felt that benefit should result from the creation of facilities for getting into somewhat closer touch with consumers in the outlying area. Recently, therefore, steps were taken to secure these ends by the opening of fresh show-rooms and stores farther afield; and the change that has been made has proved to be of very great advantage all round.

The spot chosen was at Harwood Terrace, adjoining the Fulham works of the Company; and for the show-room, inspectors' department, &c., a building has been requisitioned which was formerly used for other purposes. An entirely new range of stores has, however, been erected in connection with the scheme. The branch was opened at the beginning of March, when the work of four districts was transferred to it—Fulham east, west, aud south, and Walham Green—which entailed the removal there of 25 inspectors, assistants, and clerks, besides a working staff of 180. The consumers living in the Fulham district, of course, find the depôt a great convenience, not only for the purpose of paying their accounts, but also for selecting any goods required, for which purpose it was previously necessary for them to journey to Kensington. The show-room is kept open until eight o'clock in the evening, so as to give everybody—the working men especially—a chance of looking in. On the Company's side, too, there is a great saving in regard to the labour attached to the district, owing to their men being always on the spot. No extra expense has been incurred in connection with the staff. On the contrary, up to the present the saving, by labour done away with, &c., has been very substantial, owing to the greater rapidity with which the consumers can be reached. In fact, the results in all directions seem to have exceeded what was anticipated when the new arrangements were first of all put into operation; and the usefulness of this local depôt, both to the Company and to the consumers, has been demonstrated in a very short time.

The ground-floor portion of the building which is now used as a show-room was formerly the clerk's office belonging to the Meter and Stove Department (of which Mr. W. Fagan is in charge). The clerical staff are now all housed in the upstairs portion of the premises, where there is excellent accommodation provided for them, for the inspectors, and for Mr. E. Pilbrow, under whose care this depôt has been placed, in addition to the Kensington High Street branch, which was already under his charge; and there is quite a tempting little dining-room.

To return to the show-room, there is—as would naturally be expected—to be seen here a representative display of all that is best and latest in appliances for use with gas; and these are shown off to the greatest possible advantage by the plain but handsome light oak furnishing of the room, and the polished teak platforms on which the goods are ranged. A number of wall-brackets find a resting place on two tripod stands which are formed of upright steel rods; while others are fixed at intervals round the walls. These latter are all controlled by pneumatic switches from a board placed near the door of the room; and one of the overhead lamps—for the ceiling, of course, is dotted over with pendant lights of all descriptions—is also turned on and off by the same means. There are two Fletcher fitted overmantels in different colours—one with an Edgar "Blenheim" fire and the other with a Richmond "Arabian," both of which look exceedingly nice in their handsome frames. The "Blenheim" fire, of course, fits into an ordinary grate; and the Company do a good business with it among customers who do not care to see their existing fireplaces removed. In the show-room there is a cashier's counter; and this has very wisely been arranged at the end farthest from the door, so that callers are obliged to pass the tempting things on view before reaching their destination. In one corner, too, there is a bath; and here there are to be seen in operation a Wright "Sun" boiler and two of Ewart's and two of Maughan's geysers. Quite a feature is made of up-to-date gas

terature; a table near the door being piled with booklets likely ɔ appeal to visitors. Turning to the walls, one's eye is immeiately caught by a number of excellent show-cards which have xchanged the push and bustle of the Franco-British Exhibition or the quieter neighbourhood of Harwood Terrace. The numerous ookers, fires, &c., which stand all about the show-room need not e referred to in detail; but one point outside gas fuel ought to e mentioned—the fact that coke is displayed in the most recent ıethod of packing for small quantities. That is, in paper bags. 'hese bags hold 28 lbs.; and the consumer can have delivered ɔ him either ordinary coke or "Carbo," the price for the former eing now 4d. and for the latter 5d. per bag.

Leaving the show-rooms and offices, we pass through a large overed-in yard, to an extensive piece of ground at the back, along ne side of which has been erected a range of ground-floor stores, tters' offices, &c. A good deal of ground in front of these buildıgs is still available for cultivation; and in this the men are perıitted to make small gardens for themselves. The stores, in vhich Mr. Pilbrow justly takes a considerable amount of pride, re, as already remarked, a row of one storey buildings; and along he whole length the roof consists largely of glass, which affords xcellent lighting. In front, too, there is a wide covered-in space, vhich effectually protects the men in wet weather. The first of the ange is the fitters' workshop; the next is the maintenance office nd stores, for fitters who attend to the maintenance of consumers' ɔurners. This is an entirely separate department; and there are mployed at the depôt eighteen outdoor maintenance men. The hird section is the fitters' room, with foremen's offices leading ff, and divided so that each foreman can have a fitter in and alk with him in private in his own office. These foremen's offices re in direct communication, by telephone, with the inspectors' ffices in the main building above the show-room. Every fitter has locker to himself; these being ranged under a row of desks. The tore itself has three large lift-up windows, with a serving counter itted on both sides of them, to facilitate the issue of materials o the fitters in the morning; every endeavour being made to get ll the men out by half-past eight. There is also a Dey timeegister, by which between thirty and forty men per minute can ɔunch-in their time. Under the old system of each man signing is name, the registering, of course, took about ten times as long. Vithin the store are tiers of bins wherein materials of all sorts ınd sizes are stocked; pipe-barrel being placed in perpendicular eceptacles at the side, and parts to fit each make and size of stove n racks. Big and small dry meters are stacked on shelves—from 3-light up to 100-light. Larger sizes than this can be obtained rom the meter department which is part of the same depôt.

One of the most striking features of the stores is their airy and oomy character. In fact, the whole place—facing, as it does, a arge extent of uncovered ground—is very open, and really quite ıttractively situated. On entering the door of the store proper, he men are confronted with a printed bill which should afford hem food for reflection, and stimulate them to the exercise of heir best endeavours on behalf the Company—and themselves. The wording so concisely, and at the same time admirably, sums ıp the case for co-partnership, that the liberty may be taken of reproducing it here.

A Daily Reminder to Co-Partners.

Time	Saved	Mean Money Saved.
Materials	"	
Mistakes	"	
Complaints	"	

Money saved means Cheaper Gas.
Cheaper Gas means Higher Bonuses and Higher Dividends on Invested Bonuses.

The large covered-in yard already referred to is in reality a sub-station in connection with the Haggerston meter testing department—both being under the charge of Mr. Fagan. On one side there is a room fitted with all the necessary appliances for the testing of meters, &c.; while on the other the repairing of stoves and meters is carried out. At present, for cleaning purposes, the stoves are "pickled," which is, of course, a more or less lengthy process, according to their condition; but arrangements will shortly be made for the utilization of a sand-blast in connection with this work—a method which, as "Journal" readers are aware, has already been found to answer admirably elsewhere. In connection with this portion of the premises, there are two small gasholders, in which the gas that has been used for meter testing is collected, instead of being blown to waste. This gas, having been mixed with the air in the meters, would not perhaps be suitable for use in flat-flame burners; but as all the lighting of these buildings is on the incandescent system, it is found possible to make use of it for illuminating purposes, with great advantage from an economical point of view. Indeed, though the two holders cost between £350 and £400 to erect, it is calculated that they paid for themselves within two years. Close by there is an artesian well, which has been sunk to a depth of 450 feet, and is now in use. The yield is estimated at 2500 gallons per hour; and the water will be forced by compressed air into an overhead tank which has a capacity of 10,000 gallons.

The outside lighting has naturally not been neglected; the capabilities of gas being demonstrated by two Keith high-pressure 1500-candle power lamps, which are operated by a small engine of the Gardner type and a Keith compressor.

THE TWIN-LIGHT BURNER.

Upright incandescent burners and inverted incandescent burners have both long been familiar objects to all; but an arrangement which combines the two principles in one casting needs some sort of introduction. Of this character is the "twin-light" burner; and therefore no apology will be called for in giving some few particulars in regard to the device—which is being marketed by Twin-Light Burners, Limited, of No. 49, Wool Exchange, E.C.

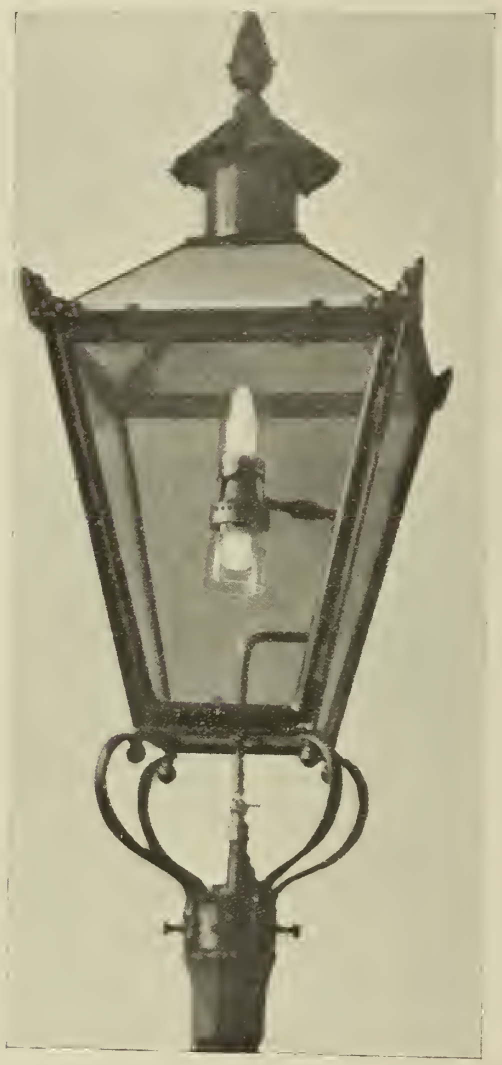
The accompanying illustrations show the adaptation of the invention to street-lighting purposes; and it is in this direction that attention has first been turned. But that the burner is equally applicable to general indoor lighting, will be apparent; and, as a matter of fact, we understand that lamps suitable for factories and business establishments, as well as fancy patterns for house lighting, are now in course of manufacture at the works the Company have secured in London. The photographs make clear the form of the arrangement, which consists of a cast body or chamber

Street-Lantern with Three "Twin-Light" Burners.

(made of aluminium), with an inverted and an upright mantle both supplied from the one bunsen. An elbow in the centre of the chamber is so constructed that it sets up a natural flow of gas to the inverted mantle, the result being—so Mr. J. W. Blakey, the Managing-Director, informed a "Journal" representative who called upon him to see the burner a few days ago—that four-fifths of the supply of gas goes below, and only one-fifth above. All the heated products from the inverted mantle are collected, and pass through gauze into the heated chamber, where they mingle with the one-fifth of the gas supply already mentioned, after which the mixture is utilized to render the upright mantle incandescent. In other words, the heated products passing from the lower burner, with a further small admixture of gas and air at a high temperature, are used to secure the luminosity of the vertical mantle above, so that practically complete combustion is said to be obtained—with resultant considerable economy. But, in addition, the claim made by the inventors is that by this means the distribution of light is much more effective than where two mantles are set side by side. There are, it may be mentioned, no stamped parts whatever in the burner, except the gallery for carrying the chimney; and the whole thing is of English make.

The invention has been reported upon by Mr. T. W. Baker,

who states that tests of the burners made by him showed an efficiency of 30-candle power per cubic foot of gas at a pressure of 22½-10ths. He remarks that the conservation of the heated bye-products, with the addition of just sufficient fresh coal gas to revivify these spent heated gases brings about a combustion equalling pressure gas, with similar results. This, he adds, is secured without mechanism; and thus the burner gives this very high efficiency at the usual pressures, and at a cost which will probably not exceed existing low-pressure burners. Mr. J. H. Starling, who has also made a report, says that photometrical examination of the illuminating power over a long series of tests under varying conditions, gave him an average of 33 per cent. more than he has secured from any incandescent mantle. The tests extended over four days; the gas pressure was normal; and in the street lanterns the results were even higher than those obtained on the photometer with open burners. This high efficiency will, he feels confident, be increased in the open air.



Street-Lantern with One "Twin-Light" Burner.

We gather that Mr. Blakey does not urge any novelty for the idea upon which the invention is based, but simply that a method has been devised of accomplishing what many attempts have been made to do before. Neither does he claim any extraordinary candle power results, though at the same time he points out that something over the average in this respect must be secured. The advantages of the system, as they appeal to him, are, to use his own words, "You have the light where you want it; and you are getting the whole of the value of the heat from the inverted mantle, which up to the present has been lost." The burners are made for use with ordinary sized mantles; and these are said to be rendered fully incandescent, at a pressure of 22½-10ths, with a gas consumption of 5½ cubic feet per hour. Brass was first selected as the material of which the burner should be made; but subsequently aluminium was chosen as being preferable. It is found that this does not lose its colour by use.

The respective merits of upright and inverted mantles—more particularly for street lighting purposes—have frequently been discussed; but here is a system by which, if it proves satisfactory in every-day practice, it will be possible to secure the advantages of both methods. As to how far the burner will fulfil what it is intended to do under ordinary working, engineers will no doubt satisfy themselves by practical tests before adopting it; and this is precisely what Mr. Blakey asks that they should do. Certainly he is able to demonstrate that a good illuminating effect can be secured under laboratory conditions.

A STREET-LAMP CONVERTER.

A new device is being introduced by the Wholesale Fittings Company, of No. 30, Commercial Street, E., by means of which an existing system of street illumination by upright mantles may be easily and economically converted to the inverted style; while at the same time, it is claimed, greater brilliancy is obtained with a lower proportionate consumption of gas.

A converted lantern is illustrated by fig. 1, and the converter by fig. 2. The latter combines in one simple piece of apparatus a reflector, a bye-pass, and a special arrangement, which, by the moving of a revolving bar on its axis, automatically lights or extinguishes at will either one or all the burners. The bye-pass, which, of course, is left alight when the burners are turned off, is automatically extinguished when the lamp is in use. It is stated that the burners give a reflected downward light of somewhere about 120-candle power per burner with a consumption of from 3½ to 4 cubic feet of gas per hour, according to the pressure at which it is supplied.

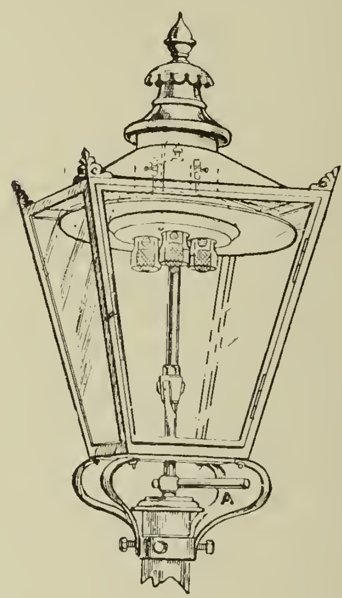


Fig. 1.

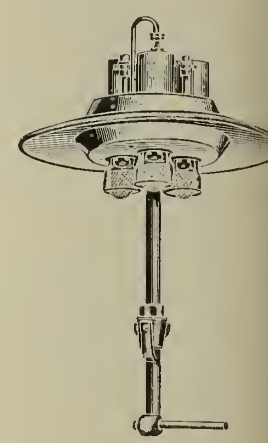


Fig. 2.

The Wholesale Fittings Company's Street-Lamp Converter.

The arrangement can be supplied fitted with one, two, or three lights; and the reflector (which is made of strongly enamelled steel) can be of any shape desired. The reflector, it may be remarked, acts in a double capacity. First, it reflects the light downwards and outwards; and, secondly, it induces a forced draught of pure air—admitted only from beneath—upwards; the spent gases passing through the ventilating shaft in the centre of the mantle holders or carriers, which are made of a specially refractory material to resist the extreme heat. In conclusion, it may be mentioned that the fitting can be made to any desired dimensions to suit existing lanterns, or it can be supplied complete in lanterns which are well made and warranted wind and rain proof.

REFLECTIONS ON CARBONIZATION.

IV.

By Thomas Settle.

Many invitations and appeals for something better in carbonization have been made during the past ten years. This year's Gas Institution meeting has left us with an all-round sort of confession that "carbonization is now in the transition stage," with also the previous admissions that there is "large degradation" to the illuminating power as the result of improper conditions under which coal gas is at present manufactured. It will here be perhaps as well to repeat some expressions of opinion recently given.

Mr. S. Y. Shoubridge, in the course of the discussion, said:

> They had not reached that stage of development in which it was thought wise to incur the expense of making very costly tests.

Dr. Colman (discussion):

> From the point of view of those who wanted to know what was the best plant to adopt for the future, they were all in a state of great perplexity.

Five years ago (Irish Association) Professor Lewes said:

> Of new methods of carbonization the main essential must be that the whole of the coal, and the whole of the gas evolved from it, shall receive as nearly as possible uniformity of treatment in the process of carbonization.

Then speaking on the Settle-Padfield process, he continued:

> It is clear that by charging the coal in small portions in this way into the retort the trouble which has heretofore existed, of the gases having to pass through a mass of incandescent carbon, is avoided; while the temperature of the retort itself can be kept lower than is the case when a large charge of coal is inserted into the retort.

Mr. Norton H. Humphrys, in his report on the Settle-Padfield rocess (June 23, 1903), says:

> One notable point is that the working temperature need not be so high as that required to ensure satisfactory results in ordinary working. It has long been recognized that the plan of introducing the charge practically instantaneously at one operation possesses inherent defects, and that the temperature of the retort must be considerably in excess of the average carbonizing temperature attained by the material.

Beyond au adhesive claim to any reward for work done, and the esults obtained by such work, nothing is further claimed by the vriter in regard to the Settle-Padfield process other than being he "first and true inventor." It is obvious that the taking out of a patent and the publication of a complete specification is proof hat "demonstration is the best mode of instruction." The writer s still a student, with, unfortunately, not a square foot of retort-house floor space to either work upon or to render any further assistance in the actual operations of any plant. The heightened revival of interest iu the matter of carbonization offers a fitting opportunity to add one's experiences with the object of "putting a few more ideas into the melting pot," which is something at least one may be truly thankful for.

Sufficient has been said, and proofs adduced, regarding the non-uniformity of action in horizontal retort carbonization; and it is now necessary to advance the opposite, and attempt to show where, and how, uniformity of action may be obtained—at the same time not relying on one's own work and experiences too much, but on the work and results of others more competent, following up the repetition of new sayings to place alongside the old sayings, and from them both select anything to assist in solving Dr. Colman's remark: "This was the problem." The Settle-Padfield process aroused interest to the extent that not a few men of high scientific attainments and expert knowledge in chemistry and carbonization were sent down to Exeter in order to test the process; and depending more upon their records than any tests by the staff or myself, it is pardonable, I hope, to link a few home tests in order to complete the chain of evidence I am so anxious to show.

Professor Lewes, reporting on the process, said:

> The Settle-Padfield process appears to me to be one of the most important practical advances in the carbonization of coal since the introduction of the horizontal retort in the early years of the last century. . . . . By its adoption, an increase of between 20 and 30 per cent. in the volume of gas per ton carbonized is obtained over that yielded from the same material when carbonized in horizontal retorts.

Mr. Norton H. Humphrys, in his report on the Settle-Padfield process (see "JOURNAL," Vol. LXXXII., p. 881), stated:

> The result is more regular production both in respect to quantity and quality, in place of a mixture of widely varying quantities and qualities.

Mr. W. Chattaway, F.I.C., late Gas Examiner to the London County Council, &c., in his report stated:

> I regard this method of carbonizing as based on thoroughly sound scientific principles.

Six years afterwards (1909), we hear Mr. John West, of Manchester, in the course of the discussion at the recent meeting of the Institution of Gas Engineers ("JOURNAL," Vol. CVI., pp. 861, 862), saying:

> They obtained a much larger yield of gas per ton from the verticals; they got the illuminating power; there was an increased quantity of tar; and a very superior coke. . . . . With coal which on an average gave about 10,000 cubic feet he had got 12,300 cubic feet of gas, of 13·75-candle power with a Carpenter burner. . . . . There were no doubt elements in connection with it which lent themselves to the proper carbonization of coal.

Mr. A. F. P. Hayman (Berlin), in the course of the same discussion, said:

> They had tried vertical chambers in Berlin; and they found they did not answer at all. . . . . The saving of labour was considerably nullified by the irregular quality of the gas, which Dr. Lessing admitted to be a fact.

Dr. Lessing, speaking of vertical chambers, in the discussion (p. 864), said:

> He disclaimed from the outset any advocacy of this system of carbonization. He himself was rather in favour of continuous charging, believing it to be more scientific to maintain a certain state of carbonization at every point of the distillation vessel.

There could not possibly be any stronger condemnation of a system than, after due trial of it, to say: "It did not answer at all," and this, too, supported by a disclaimer of such a system by Dr. Lessing.

Turning for a moment from vertical chambers to vertical retorts, one welcomed the confession of that veteran carbonizer, Mr. John West, in his words (p. 861): "If he had the same coal that his friend used, he believed he could do much better with verticals," and which he had already backed up by saying he had obtained 23 per cent. more in volume of gas than he thought he could do with horizontal retorts.

It would take considerable space to publish the mass of results obtained at Exeter in the course of fully two years' experiments. Without, then, repeating or giving a mass of tabulated results, some separate, also average, tests may here be given.

Professor Lewes:

VERTICAL RETORT.

Coal—No. 4 Slack.

Make per ton, cubic feet	13,250
Average illuminating power	14·72
Coke, pounds	1645
Tar, gallons	Nil
Sperm value, lbs. per ton	668
Heating value B.Th.U.	533·7

HORIZONTAL RETORT.

Make per ton, cubic feet	9802
Average illuminating power, candles	15
Sperm value, lbs. per ton	504
	Gain, per cent.
Gas	35
Sperm value	32

The undermentioned tests, made by Mr. Norton H. Humphrys, are averages of three tests using different slack coals. The first set of tests includes the tar as yielded.

VERTICAL RETORT.

	1.	2.*	3.†
Make per ton, cubic feet	12,498	13,400	13,142
Average illuminating power, candles	13·8	13·6	14·71
Coke, lbs.	1624	1623	1602
Tar, gallons	5·20	*nil*	*nil*
Sperm value, lbs. per ton	591	625	662

* Before test. After some alterations to the setting of the vertical retort and the fixing of the apparatus for returning the tar to the retort as made, Mr. Humphrys was again asked to make further tests. The following is an average of three tests made by him, using three different slack coals.

† This is an average of five testings by three engineers and experts, using two Yorkshire slack coals; one Durham; and one Somerset.

HORIZONTAL RETORT.

	Using Same Coals, but Through and Through.	Same Coals, but Through and Through.	Two Yorkshire Slacks, one Durham, one Somerset.
Make per ton, cubic feet	10,083	10,276	10,410
Average illuminating power, candles	14·21	14·39	16·16
Coke, lbs.	1600	1590	1600
Sperm value per ton	491	506	577
	Gain, per cent.	Gain, per cent.	Gain, per cent.
Gas	23	30	26
Sperm value	20	23	14

The following six hours' test, selected (July 28, 1903), made with No. 5 slack coal at Exeter, not only shows the regularity of production and illuminating value, but also the records of temperature carefully taken, of the evolved gas in passing through the ascension pipe 6 feet from the mouthpiece, and by a second thermometer fixed 25 feet away from the first one and 11 feet on the outlet side of the hydraulic main. This test, for the convenience of better illustration, is shown at the per ton and hourly rate on the registered quantities and qualities covering a large number of readings for temperature and illuminating values.

	At per Ton. Make Cubic Feet.	At per Ton. Candle Power.	Average Temperature Evolved Gas 6 Feet from Mouthpiece.	Average Temperature of Gas at Outlet of Hydraulic Main.	Number of Readings.
First hour	2,270	13·80	380° Fahr.	155° Fahr.	17
Second ,,	2,260	13·60	370 ,,	135 ,,	12
Third ,,	2,210	13·50	368 ,,	130 ,,	21
Fourth ,,	2,200	13·38	360 ,,	130 ,,	13
Fifth ,,	2,200	13·64	355 ,,	128 ,,	15
Sixth ,,	2,140	13·00	342 ,,	125 ,,	18
	13,280	13·48			

It will be noticed there is only a difference of 5·73 per cent. between the highest and the lowest hourly production, and only 5·8 per cent. difference between the highest and the lowest candle power. The temperature on the first thermometer shows a difference of 10 per cent., while the second thermometer shows a difference of 20 per cent. The fluctuation of temperatures previous to the charge of coal (7 lbs. each charge) and immediately after the charge enters the retort varies considerably, as may be seen from a few of the many readings given below:—

June 28, 1903.

Charge.	Immediately Before Charge Dropped In.	Charge In. Gas Evolved Very Rapidly.
No. 1	144° Fahr.	220° Fahr.
2	252 ,,	282 ,,
3	310 ,,	330 ,,
4	400 ,,	450 ,,
5	358 ,,	390 ,,
6	348 ,,	398 ,,

N.B.—The above readings, distributed over five hours, were taken as quickly as possible after the introduction of each charge of coal.

With Dr. Bueb's published results of temperatures (March 1906) of the working of the Dessau vertical retort, comparison might again be made to aid the further deep interest now being taken in vertical retort systems of carbonization. A reproduction

of the remarks by the writer will best serve, bringing to notice again the remarkably wide difference in range of temperature as obtained in bulk charging and intermittent or continuous charging.

"JOURNAL," March 13, 1906 (p. 716):—

It is difficult to understand that, while the temperature of the "cold core" at the end of the first hour was only 145° C. (293° Fahr.), the temperature of the evolved gas was 190° C. (374° Fahr.); and that it was not until the fourth hour had been reached that the "cold core" within the retort exceeded the temperature of the gas evolved outside the retort altogether—viz., 370° C. (698° Fahr.) "cold core;" 318° C. (604° Fahr.) evolved gas. It is none the less difficult to reason that, with a temperature of about 1400° C. (2250° Fahr.) playing round the outside of the retort, and the outer ring of the column of coal pressing against the side of the retort exposed to the same temperature, the transmission of heat (say, 8 inches one way and 5 inches the other) is only able to raise the temperature of the core of coal 250° C. (482° Fahr.) in five hours.

From eleven different classes of coal (slack), representing over 100 tests and extending over a period of three months, the general average (including independent tests already given) is as follows:

VERTICAL RETORT.

Make per ton, cubic feet	13,189
Average illuminating power, candles	14·56
Tar, gallons	*Nil.*
Coke, lbs.	1614
Sperm value, lbs. per ton	656

HORIZONTAL RETORT.

Eight out of the eleven classes of coal only.

Make per ton, cubic feet	10,120
Average illuminating power, candles	14·5
Coke, lbs.	1600
Sperm value per ton	503
	Gain, per cent.
Gas	30
Sperm value	30

In the eleven classes of coal, representing tests of six days' duration each, there is only a difference of 3·5 per cent. between the highest volume obtained per ton and the lowest. This would tend to show that, in coals carbonized under such conditions as these were, there is not that difference which exhibits itself so prominently in bulk charging and carbonization. One coal may swell, another may not, while a third may swell for a time and then rapidly contract. No doubt there is something in the important factor heat and its influence in different degrees on different quality gases, the penetration rate, the speed of evolution, and the velocity through heated space, and also the vital importance of removing the gas quickly from destructive exposure.

(1) In the average illuminating powers per ton of the eleven classes of coal, there is not a difference of 1 per cent. in candles between the highest and the lowest, which is going very much towards proving that such slight variation must be due to the timely removal of the gas as regularly evolved from the coal.

(2) There is only 7 per cent. difference in the sperm value per ton of coal carbonized between the highest and the lowest of the eleven classes of coal put through the Exeter retort.

(3) Hour by hour (reckoning six) there is only 0·7 per cent. difference in the candle power between the highest and the lowest, averaged at the end of each hour's readings.

(4) Only a difference of 22 per cent. exists between the highest and lowest production in six hours; and it is only just to the process to add that the sixth hour was purposely ended in order to measure tar (if any) liquor, and weigh the coke in order to record the tests every sixth hour.

(5) Lastly, there is only a difference of 0·8 per cent. in the sperm value of gas obtained between the highest and the lowest of any hour during the six of continuous carbonization.

A careful study of these results, and the facts, as given, would surely entitle anyone to claim proof of uniformity of action in the carbonization of coal, and that such results would justify condemning distillation in horizontal retorts as not only being extravagantly wasteful, but a process to be shunned, and not worthy of being followed any longer than is necessary to "Let there be light."

Collected Researches of the National Physical Laboratory.—We have received from the Director of the National Physical Laboratory (Dr. R. T. Glazebrook, F.R.S.) the fifth volume of the "Collected Researches" carried out under the supervision of the Laboratory. The contents include thirteen subjects, and occupy 266 large quarto pages. Among the questions dealt with are "Experiments on Wind Pressure" and "A New Fatigue Test for Iron and Steel," by Dr. T. E. Stanton, M.Inst.C.E., the Superintendent of the Engineering Department; and "Screw-Threads," by Mr. H. H. Jeffcott, B.A., one of the principal assistants in the Physics Department. Dr. Stanton's contribution on "Wind Pressure" is a reprint, with additions, from the "Proceedings of the Institution of Civil Engineers." It was noticed in the "JOURNAL" for Dec. 10, 1907.

REGENERATIVE FURNACES AND TAR FUEL.

By Sig. CRISTOFORO COLOMBO.

[Abstract Translation of a Paper read before the Italian Gas Society.]

Under the title of "Producer and Regenerative Furnaces Fed Entirely with Tar," Sig. Cristoforo Colombo, who is the Chief Technical Officer of the Consumers' Gas Company at Turin, read a paper before the members of the Italian Gas Society at their annual meeting last month. The paper is given in our contemporary, "Il Gaz," from which the following abbreviated translation is taken.

The continued competition of electric metallic filament lamps requires directors of gas-works to discover means to reduce the first cost of gas to be able to supply it cheaply. Thus, while the latest methods of carbonization should be adopted to obtain the best make and to reduce labour charges, efforts should be made to find some more remunerative outlet for the bye-products. Of these, tar is the greatest difficulty. A new method of using it as a fuel will not, therefore, be without interest—a method practical by its being able to be regulated, reliable by its simplicity, and really economical.

Up to now, tar as a fuel has only been used in fire-bar furnaces, in which the tar either drops by itself or is forced in by an air or steam injector. The air for combustion, without being previously heated, is led, together with the tar, into the combustion chamber, and the products of combustion go to the chimney, almost at the same temperature as that of the furnace. The regulation of the tar is difficult. With an injector the tar and air are better mixed, combustion is more complete, and consumption is reduced; but there are inconvenience and interruption in its working. The importance of a tar-fired bed, which is considerable when compared with a direct-fired furnace (as it uses 1 kilo. of tar in place of 2 kilos. of coke), is much reduced when it is compared with a regenerative furnace. The general adoption in medium and small gas-works of retort-beds of a full or semi-regenerative character rendered still rarer the use of tar as fuel. Tar-fired beds, further, required continuous care, to avoid direct attacks of flame, and a large combustion chamber. The new method enables liquid fuel (tar) to be used in regenerative furnaces in place of solid fuel.

In the Consumers' Gas Company's works at Turin, for six months four fully regenerative beds have been working entirely with tar without the slightest trouble, and saving quite lire 20,000 (£800). Working with coke, each retort carbonized 170 kilos. (over 3¼ cwt.) in 4 hours 48 minutes, or 7650 kilos. (say, 7½ tons) per bed of nine retorts in 24 hours, with a fuel consumption of 1200 kilos. (23½ cwt.), or 15·6 per cent. The same settings, working with tar, carbonized 190 kilos. (3¾ cwt.) per retort in 4 hours 48 minutes, or 8550 kilos. (8 tons 8¼ cwt.) per bed and per 24 hours, with a tar consumption of 800 kilos. (15¾ cwt.), or about 9·35 per cent.

In regenerative furnaces, high temperatures and fuel economy are possible either by limiting the air almost to the amount theoretically necessary, or by heating part of it at the expense of the heat in the waste gases when they leave the retort-chamber. To limit the air to what is strictly necessary requires a gaseous fuel. The gasification of solid fuel is effected in the producer either by an incomplete oxidation of the carbonic oxide with the oxygen of the primary air, or by the decomposition of steam. In the dry method, the heated secondary air constitutes little more than half of the total air, and the waste gases go to the chimney at a relatively high temperature (from 500° to 600° C.). The wet method allows of double regeneration, and increases the proportion of secondary air; and the gases go to the chimney at 200° to 300° C.

Wishing to use tar in the producer, or, rather, wishing to extend to tar fuel all the advantages of a regenerative furnace, where and how ought the tar to be admitted? What will be the functions of the primary and secondary air? To gasify tar, it is obviously enough to distil it. The producer of the existing bed supplies a very good laboratory for the purpose. The requisite heat to distil the tar is provided by the complete combustion of part of the liquid fuel—in the case of tar, by the combustion of pitch, which is collected in small layers on the fire-bars, by means of the primary air, which may be called that of distillation. Varying the amount of primary air in the producer will vary the amount of fuel burnt in it; it will vary the temperature of the distillation, and, consequently, the nature of the resulting gases. In short, the producer provides a perfect method of gasifying the tar, which simply falls into it without the need of any injector. The heat produced in the generator passes into the retort-chamber with the products of the distillation of the tar. The substantial difference between the new and old methods consists in this—that whereas formerly the liquid tar was admitted directly into the retort-chamber, now a perfectly gasified fuel from a preliminary distillation is introduced, and this gaseous fuel burns with the previously heated secondary air in an exactly similar way to the former working from a producer with coke. The primary air in the new method, as verified in the settings at work, is in the proportion of $\frac{1}{12}$th to $\frac{1}{15}$th of the total air. The secondary air, therefore, constitutes practically the whole of the air required.

The initial temperature in the retort-chamber is very high, because all the calories of the highly heated secondary air are carried to the nostrils.

The greater number of calories regenerated by the heating of a larger amount of air at a high temperature and carried to the point of utilization can be used to obtain a higher initial temperature, and thus to increase the carbonizing capacity of the setting, which was brought up to 1000 kilos. (1 metric ton) per retort of 3 m. (say, 10 feet) in 24 hours.

The advantages of the use of tar compared with coke may be summarized as follows:

1.—Complete regeneration and better yield than from double regenerative furnaces with steam supply—less expensive, and more simple.

2.—Doing away with the fatiguing work of clinkering, owing to complete absence of clinker, and consequently longer life of refractory lining of producer.

3.—Reduced height of producer; there being no need of depth of fuel. Hence less cost of furnace.

4.—Easier and quicker regulation of temperature, as, besides the primary and secondary air, the flow of tar can also be regulated.

The proportion between the tar and the coke used in the same furnace for the same work will be in the same relationship as their calorific powers. Coke is 7300 calories, and tar is about 10,700; so that 682 grammes of tar ought to be substituted for 1 kilo. of coke. For convenience sake, 100 kilos. of coke can be replaced by 65 kilos. of tar. Taking the cost of coke at 45 lire (say, 36s.) per ton, the tar, by its new use, comes to be worth lire $\frac{0.650}{45}$ = lire 69·20 (say, 55s.) per ton.

The author's patent, in conjunction with Ing. De Bartolomeis, is extended to include all liquid fuels and applications to other industries where high heats are required.

ILLUMINATING POWER OF GAS IN CANADA.

At the recent Meeting of the Canadian Gas Association, Mr. JOHN KEILLOR, the Superintendent of the Hamilton (Ont.) Gas Company, read a paper on the above subject.

The author began by asking whether gas companies in Canada make and sell the quality of gas best suited for present-day requirements. This was, he said, a question which, as an Association and individually, they ought to consider and pass judgment upon, for the following reasons: "(1) That for 23 years there has been no change in the Dominion Government Statutes regulating the testing of gas and the candle power that is to be supplied. (2) That during these 23 years the methods of using gas have so totally changed that there is no longer any need for supplying to consumers the quality of gas prescribed by the Gas Inspection Act of 1886. (3) That in other countries regulations respecting the testing of gas have been revised to suit the new conditions, and the candle power of the gas reduced." He then went on to make the following remarks.

Speaking generally, gas companies in Canada are supplying gas of 16 to 20 candle power—more often about 17 candles. In order to avoid penalty, gas makers are anxious to maintain the illuminating power rather higher than the 16-candle standard prescribed by the Gas Inspection Act, 1886. If, therefore, we take as the average 17 candles as tested by the "standard burner," we have a fair representation of the quality of the gas at present being made and supplied throughout the Dominion. The questions I put to you are: "Do we really need, in the year 1909, to make and send out this 17, or even 16, candle gas? Does the consumer demand it? Is it the best and cheapest gas from his point of view? Are we making it because it is the best all-round gas for the needs of consumers generally; or have we, by long and patient practice, become so expert at making and blending this quality that we dislike the idea of a change?" Probably it would be more correct to say that we are making it because the Gas Inspection Act requires that this quality should be made. Anyhow, if we are making it because it is the best all-round gas for the needs of customers, then there would be no occasion for changing the Statutes and advocating a reduction in illuminating power of the gas sent from the works. On the other hand, if we were agreed that it was in the best interests of the consumers and the gas companies alike to make and distribute (say) a gas of lower power than 16 candles, then it would be apparent that the regulations as they exist are wrong and require to be amended to suit the new and more economical methods and conditions of using the gas.

Similarly, it may be queried: "Is the grade of gas which was best suited for the requirements of gas consumers in 1886 the best suited and most economical for consumers in 1909?" Personally, I say it is not. Then, if it is not, and you agree with me, why are we making it? It is well known that the great bulk of the gas we are making to-day is being used for purposes totally different from those for which gas was made and used in the year 1886, when the legislation governing the quality was enacted. In that year, practically all the gas made by gas companies was sold for illuminating purposes by the argand, flat-flame, and other burners. The proportion consumed for cooking and heating in those days would not amount to 5 per cent.; while none was employed for power purposes and lighting by incandescent burners.

To-day these conditions are radically changed. We find, according to reliable authorities, that instead of about 5 per cent., or less, of gas being used for cooking, heating, and lighting by incandescent burners, from 70 to 80 per cent. is used for these combined purposes, and not more than about 20 per cent. for lighting by the argand and flat-flame luminous burners—the former having dropped out of use altogether.

Since 1886, luminous flame gas-burners have almost totally disappeared, having been superseded by modern upright and inverted incandescent burners in nearly all places where good illumination is required. Nowadays, a light of 60 candles can be easily obtained from a good type of incandescent burner consuming 3 cubic feet of gas per hour. Compare this with the illuminating power obtained from the standard argand burner referred to in the Act of 1886:

Type of Burner.	Gas consumed per Hour. Cubic Feet.	Candle Power.	Candles per Cubic Foot of Gas Consumed.
Standard argand burner	5	16	3·2
Modern incandescent burner	3	60	20·0

The modern incandescent burner yields about seven times more light per cubic foot of gas consumed than the argand, and from a gas of lower quality than the Government standard.

Taking into consideration these changed conditions of using gas and our own every-day experience, it is evident that what we are called upon to supply now is not a "lighting" but a "fuel" gas. For, in addition to gas used for cooking, heating, and power, is not the gas required for use with the mantle burner in the same category? We do not push the sale of a single appliance now-a-days that necessitates the making of gas of high candle power. The gas-range, the water-heater, the industrial furnace, the gas arc, &c., can all be well served with a lower-grade gas than we are now making; and consumers who use these appliances represent our best and most profitable customers. Let us be sure, then, that we are making the grade of gas best suited for the majority rather than for the minority of our customers. I am afraid most of us to-day are supplying gas that suits best the minority luminous-flame customer. Many of us know it and admit it; but we shelter ourselves under the Gas Inspection Act, which compels us to make this quality of gas.

I am one of those who would like to see the illuminating power of gas in Canada down to at most 14 candles, or to 13 or even 12 candles, if the calorific value were not depreciated too much thereby. Of what use is it to keep up the quality by 2 or 3 candles at considerable cost, when the consumer can now get a vastly superior light by the incandescent burner from a common coal gas of from 12 to 14 candles? Moreover, this quality is good enough for all other purposes for which gas is used, representing at least 80 per cent. of our output.

There is another good reason why we should have a reduction in illuminating power. I understand that in 1890 an amendment to the 1886 Act was passed, providing that "the expression 'gas' be held to include natural as well as manufactured gas." Now, it is well known that natural gas, which is practically non-luminous in flat-flame burners, is allowed to be used for general lighting purposes; and the Government do not compel natural gas companies to enrich their gas to the Government standard. As it is good enough for all practical purposes as it issues from the earth, any enrichment would be waste of money. I object strongly, however, to artificial gas companies being discriminated against. We should either be allowed to send out a lower quality gas, or the natural gas companies should be compelled to enrich theirs to the Government standard.

Air Gas and Other Illuminants.

The fourth of a series of articles on "Portable Lighting Systems," written by Mr. B. Wyand, appeared in the "Pall Mall Gazette" last Thursday. Dealing with the question of cost, the author said: It is not an easy matter to arrive at any definite figure. Manufacturers will not come quite to the point, although there can be little doubt that air gas forms one of the (if not the) cheapest form of illuminants known. The following figures are taken from manufacturers' lists; and the author does not accept responsibility for them. Careful tests, says one list, have shown the comparative cost of various systems for maintaining a 40-candle power lamp for twenty-five hours (21,000 candle-power-hours) to be:

Electric light, at 3½d. per unit	1s. 3d.
Acetylene, calcium carbide at 15s. per cwt.	1 0
Paraffin, at 8d. per gallon	1 0
Coal gas, flat flame, at 3s. per 1000 cubic feet	7
Coal gas, incandescent, ditto	2½
Air gas, petrol at 1s. 4d. per gallon	1¾

On the basis of careful tests, says another list, the comparative cost of various systems for maintaining 100-candle power for ten hours, or its equivalent, may be taken as under, taking coal gas at 3s. per 1000 cubic feet and electricity at 3½d. per unit.

Acetylene	1s. 3d.
Electric incandescent	1 2
Flat-flame coal gas	1 0
Incandescent coal gas	2½
Air gas	1½d. to 1¾

There is some considerable divergence in these figures so far as other lighting systems go, but both agree as to the cost of air gas.

INTENSITY OF NATURAL ILLUMINATION THROUGHOUT THE DAY.

Mr. Leonard I. Lewinson dealt exhaustively with this subject at the last annual convention of the Illuminating Engineering Society (U.S.A.).

It is recognized in the paper that complete data are impossible without years of effort, but the results of observations made over several separate days are given. These obviously have their limitations; but the absence of intensity determinations in previously published papers has induced the author to make them the subject of his contribution. The days chosen for the daylight tests were in September—a presumably fine month; hence the results may be well above what would be the mean for the year. It will be remembered that Professor O. H. Basquin* showed a very considerable difference between the monthly mean brightness of daylight in January and July respectively; and the foot-candle value of the brightness will vary correspondingly. To turn to the paper. The author believes that studies of the kind help in the solution of the problem why the human eye, satisfied with an illumination of 2 foot-candles produced artificially at night, requires at least 20 foot-candles of daylight for reading purposes. Though the paper does not answer the question thus propounded, the query is evidently prompted by an interesting observation incidentally made during the tests. The author noted that at a few minutes before dawn and after sunset, the daylight illumination as shown by his photometer was about 2 foot-candles. This illumination artificially produced is sufficient for reading purposes, yet the experimentalists were unable to read the instruments by the so-called 2 foot-candle daylight.

Something of the same sort has been noticed before. Mr. P. S. Millar stated at the Society's convention last year that higher intensities of light were required where the diffused method of illumination was adopted, and by way of explanation suggested that the eye craved for more intense illumination on the working plane in consequence of brilliantly-lighted general surroundings. In the particular investigation which Mr. Millar made, it was found that the average intensity required for reading purposes by ten different individuals was some 2·7 foot-candles under the direct-lighting system, and 4·45 foot-candles with illumination of the diffused type. The increased light apparentiy required in the latter case amounted to 65 per cent., and was attributed mainly to the comparative absence of the light and shade obtainable by the direct-lighting method. The subject invites further investigation. It is, for instance, a question whether the rays of direct light received by the eye during the act of reading are the same as the indirect rays falling and observed on the photometer screen. Mr. Preston's experiments and Mr. Lewinson's observations certainly tend to disturb faith in the full value of the daylight data now presented in view of the fact that they are intended to serve as criteria of the requirements of artificial illumination. The figures given by the author cover, as will be seen, an enormous range; but the admitted difference between 2 foot-candle daylight value indicated by a photometer and 2-foot candles obtained from artificial sources may well suggest some qualification.

As has been indicated, foot-candle values running from 12,420 to 0·0008 cover a tremendous range; and it would have been interesting if the paper had included fuller particulars of the method of testing and a description of the Sharp-Millar photometer with the miniature tungsten lamps in use. It would be useful to know also whether the foot-candles are derived from the pentane or Hefner standard. It is stated that while with unvarying intensity of good colour value a precision of approximately 1 per cent. can be obtained with the photometer employed, the precision of the determinations actually made was necessarily somewhat lower, on account of the great colour differences and large variations in intensity which were encountered. The experiments were conducted on the roof of the Electrical Testing Laboratories in New York City, with no obstruction to skylight. Two photometers were in use; the plate of one being horizontal, and that of the other turned so as to be normal to the direct light from the sun or moon.

The author gives in Table I. figures of three different sets of tests. In the first case, 24 hours continuous observation was made during which the sky was clear and practically cloudless. There was a slight haze all day, except during the hours immediately preceding and following noon.

Commenting upon the figures obtained, the author points out that the night illumination from the sky, when no moon is visible, approximates to 0·001 foot-candle; but he suggests that the measurements being made in a large city, artificial sources may have influenced the skylight. A fair average figure for horizontal illumination produced by moonlight and skylight on this particular night is about 0·014 foot-candle between 8.35 p.m. and 2.20 a.m. The normal illumination is about double the horizontal.

The figures of the second test were obtained during 17 hours continuous observations made on Sept. 1, 1908, and afford much the same information. The conditions were somewhat different, inasmuch as the relative humidity was greater; the sky was overcast with irregular clouds; and there was no moon at any time. The tests were made every few minutes, beginning at 4.51 a.m. with a "horizontal" foot-candle illumination of 0·081, running through the day with varying values up to a maximum of 7520, according to the obscuration or otherwise of the sun, and finishing at 9.40 p.m. with the low reading of 0·00103 foot-candle. The "normal" readings start at 7.30 a.m. with 812 foot-candles and end at 4.50 p.m. with 504; the maximum being 8570 at 1.55 p.m. The fluctuations in intensity during the day were very marked, due to ever-moving mists and clouds.

* See "JOURNAL," Vol. XCVIII., p. 742.

TABLE I.—*Tests Made Sept.* 9 *and* 10, 1908.

(Sunrise, 5.33 a.m. Sunset, 6.19 p.m. Moon full. Sept. 10, 7.45 a.m.)

Time. A.M.	Illumination in Foot-Candles. Horizontal.	Normal.	Remarks.
3.45	0·0008	..	Temp. 64° F. Rel. hum. 67·5 per cent.
4.30	0·0011	..	Slightly hazy
4.35	0·0018	..	
4.40	0·0036	..	
4.42	0·0049	..	
4.45	0·0063	..	Temp. 61° F. Rel. hum. 64·5 per cent.
4.46	0·0104	..	
4.48	0·016	..	
4.50	0·025	..	
4.52	0·033	..	
4.55	0·047	..	
4.57	0·071	..	
5.00	0·116	..	
5.04	0·500	..	
5.07	0·936	..	
5.15	2·70	..	
5.20	7·50	..	Temp. 60° F. Rel. hum. 77 per cent.
5.25	16·40	..	Sun rises 5.33 a.m.
5.37	57·00	..	
5.40	77·8	..	Sun just visible
5.44	133·4	..	
5.50	140	150	
5.56	150	317	
6.06	207	401	
6.15	301	788	
6.20	427	954	
6.30	516	1060	
6.38	645	1370	
6.50	889	1990	
7.00	1190	2630	
7.10	1230	2750	
7.30	1390	3000	
7.42	1560	4070	
7·54	1720	3970	
8.02	2340	4370	
8.15	2540	4660	
8.30	2860	4980	
8.45	2750	5300	
9.00	3500	5190	
9.15	3280	5510	Temp. 73° F. Rel. hum. 64 per cent.
9.30	4240	7200	
9.45	4550	6670	Haze increased
10.00	4760	7620	Temp. 72° F. Rel. hum. 48 per cent.
10.15	5510	8370	
10.30	5820	8680	
10.45	5350	8560	
11.00	3900	5990	Haze heavier
11.15	6420	8780	Haze lighter
11.30	6210	9630	
11.45	6850	9850	Temp. 73° F. Rel. hum. 42 per cent,
12.00M	7070	10060	
P.M.			
12.15	7070	10060	
12.30	8990	11780	
12.45	8990	12420	
1.45	4620	6640	Haze heavier
2.00	5300	6760	Haze decreasing. Rel. hum. 40 p. ct.
2.20	4100	6670	
2.45	4100	6370	Slight haze
3.00	3280	5790	
3.15	2660	5290	
3.45	2570	5050	
4.10	1820	4470	
4.45	1130	2850	
5.00	862	2220	
5.30	385	768	
6.15	92·6	..	Sun sets 6.19 p.m.
6.30	55·7	..	Moon rising. Rel. hum. 60 per cent.
6.45	11 0	..	
7.45	0·0044	0·0140	
8.10	0·0069	0·0182	
8.35	0·0108	0·0230	
9.00	0·0137	0·0264	Temp. 64·5° F. Rel. hum. 61 per cent.
9.20	0 0134	0·0298	
9.40	0·0120	0·0257	
10.00	0·0163	0·0307	
10.22	0·0154	0·0288	
10.45	0·0149	0·0312	Temp. 63·5° F. Rel. hum. 65 per cent.
11.00	0·0159	0·0254	
11.35	0·0159	0·0312	
11.55	0·0216	0·0388	Temp. 62° F. Rel. hum. 69 per oent.
A.M.			
12.20	0·0183	0·0380	
12.40	0 0139	0·0290	
1.00	0·0154	0·0320	
1.20	0·0144	0·0288	Temp. 61° F. Rel. hum. 73 per cent.
1.40	0·0130	0·0245	
2.00	0·0130	0·0269	
2.20	0·0115	0·0302	
2·40	0·0107	0·0250	
3.00	0·0072	0 0240	Temp. 61° F. Rel. hum. 67 per cent.

We have received the first number of "Ferro-Concrete," a monthly review of concrete and steel construction in engineering and architectural practice. It consists of 16 pages of very open matter and a like number of advertisements in a wrapper, and is published at 2s. 6d. per annum by the St. Bride's Press.

THE LIVESEY MEMORIAL FUND.

We yesterday received the following communication regarding the Livesey Memorial Fund from Mr. Walter T. Dunn, the Secretary to the Institution of Gas Engineers.

The Committee of the Livesey Memorial Fund, having for its object the establishment of a Professorship in Gas Engineering and Fuel at the Leeds University in memory of the late Sir George Livesey, desire me to ask if you will be so good as to print in your columns the accompanying list of subscribers to date; the total being £10,189 16s. 7d., made up as follows:—

		£	s.	d.
14	Institutions, District Associations, and Junior District Associations	342	1	6
226	Members of the Institution	943	7	7
159	Gas Companies	7,086	8	0
23	Gas Committees of Corporations	530	6	0
54	Members of the Society of British Gas Industries	538	1	0
30	Other Manufacturers, Coalowners, &c.	308	13	0
92	Directors of Gas Companies, Members of Gas Committees, and Other Subscribers.	440	19	6
599		£10,189	16	7

It will thus be seen that the sum of £10,000, the minimum required, has now been obtained. The Committee, however, venture to hope that it may be increased to £12,000, so that the Professorship may be placed on a thoroughly sound basis.

While thanking those who have already subscribed, the Committee think it probable that there may still be many who may wish to assist in the movement, but who have not yet sent in their names.

As the Committee are about to make the necessary arrangements for the administration of the fund, they will be much obliged if those desirous of contributing will do so at the earliest possible date.

INSTITUTIONS, DISTRICT ASSOCIATIONS, AND JUNIOR DISTRICT ASSOCIATIONS.

	£	s.	d.
Eastern Counties Gas Managers Association	21	0	0
Institution of Gas Engineers Birmingham Medal Fund	105	0	0
Irish Association of Gas Managers	5	5	0
London and Southern District Junior Gas Association	4	4	0
Manchester District Institution of Gas Engineers	26	5	0
Manchester District Institution of Gas Engineers, Lancashire Commercial Section	10	10	0
Midland Association of Gas Managers	40	0	0
Midland Junior Gas Engineering Association	14	7	6
North British Association of Gas Managers	31	10	0
North of England Gas Managers' Association	26	5	0
South East of Ireland Gas Association	3	3	0
Southern District Association of Gas Engineers and Managers	42	0	0
Wales and Monmouthshire District Institution of Gas Engineers and Managers	5	5	0
Yorkshire Junior Gas Association	7	7	0
	£342	1	6

MEMBERS OF THE INSTITUTION.

		£	s.	d.
Allan, Alexander	Scarborough	1	1	0
Allen, Edward	Liverpool	5	5	0
Anderson, David H.	Bastia, Corsica	1	1	0
Anderson, G. W. / Anderson, R. B.	Westminster	2	2	0
Archer, Alfred W.	Ponders End	1	1	0
Armitt, Henry T.	Santiago, Chile	1	1	0
Ashworth, J. D.	Portsmouth	1	1	0
Auchterlonie, James W.	Cambridge	5	5	0
Baldwin, John	Gainsborough	1	1	0
Barton, John	Peterborough	1	1	0
Bell, J. Ferguson	Derby	10	10	0
Belton, J. C.	Chester	0	10	6
Belton, William	Shrewsbury	2	2	0
Bennett, William H.	Dartford	0	10	6
Berridge, Thomas	Leamington Spa	10	10	0
Beynon, Robert William	Torquay	0	10	6
Bezant, Bernard P.	London	1	1	0
Birkett, R.	Bromley-by-Bow	2	2	0
Blair, William	Helensburgh	1	1	0
Bond, John	Southport	5	5	0
Botley, Charles E.	Hastings	2	2	0
Botley, Charles F.	Hastings	1	1	0
Bower, Thomas	Hartlepool	5	5	0
Braddock, James	Radcliffe, Lancs.	2	2	0
Braidwood, J. F.	Greenwich	5	5	0
Braithwaite, Joseph	Wrexham	1	1	0
Brearley, John H.	Huddersfield	5	5	0
Broadberry, A. E.	Tottenham	5	5	0
Broadhead, C. F.	Middleton	1	1	0
Brown, J. H.	Nottingham	2	2	0
Browne, A. F.	London	5	5	0
Browne, Bernard F.	Buenos Ayres	5	5	0
Buckland, William Treeman	Chesterfield	0	10	6
Carried forward		£95	11	0

		£	s.	d.
Brought forward		£95	11	0
Bugby, William	Southall, Middlesex	1	0	0
Caddick, A.	Croydon	1	1	0
Canning, Thomas	Newport	1	1	0
Carpenter, Charles	London	52	10	0
Carr, H. O.	Wandsworth	1	1	0
Cash, Joseph	Brighton	2	2	0
Chamberlain, J.	London	2	2	0
Chaney, W.	Birmingham	1	1	0
Chapman, James L.	Harrow	5	5	0
Colman, Harold G.	London	5	0	0
Colson, Alfred	Leicester	5	5	0
Cooke, A.	Oldbury	1	1	0
Copp, Harold E.	West Bromwich	2	2	0
Cotton, William F.	Dublin	10	10	0
Cross, Fredk. W.	Lea Bridge	1	1	0
Cutler, George	Stroud	0	10	6
Davey, William R.	Newbury	1	1	0
Davis, Joseph	Gravesend	1	1	0
Dickinson, Edwin G.	Lower Sydenham	1	1	0
Dixon, Harold B.	Manchester	1	1	0
Dougall, Andrew	Tunbridge Wells	2	2	0
Dougall, Archibald	Kidderminster	1	1	0
Dougall, J. S.	Boston	1	1	0
Drury, Charles Dru	Sunderland	1	1	0
Durkin, Frank	Southampton	0	10	6
Durkin, S. W.	Southampton	1	1	0
Duxbury, Thomas	Manchester	5	5	0
Duxbury, Thomas H.	South Shields	5	5	0
Duxbury, Timothy	Oldham	1	1	0
Edwards, A.	Taunton	1	1	0
Ellis, H. D.	London	5	5	0
Farrand, Frank F.	Ryde	1	1	0
Fish, Robert	East Cowes	3	3	0
Ford, William	Stockton-on-Tees	5	5	0
Frith, G. S.	Frodsham	1	1	0
Frith, J. R.	Runcorn	1	1	0
Furniss, John	Slaithwaite	1	1	0
Galleway, W.	Whitby	0	10	6
Gibb, W. Doig	Newcastle-on-Tyne	5	5	0
Gibson, Fredk.	Valparaiso	1	1	0
Gibson, James	Leigh	1	1	0
Gibson, Ralph E.	Liverpool	1	1	0
Gill, Geoffrey M.	London	1	1	0
Glover, Samuel	St. Helens, Lancs.	5	0	0
Glover, Thomas	Norwich	10	10	0
Goodenough, F. W.	London	2	2	0
Goulden, T.	London	5	5	0
Graham, Arthur	Mansfield	1	1	0
Green, Benjamin	Mitcham	1	1	0
Green, B. R.	Mitcham	1	1	0
Grimwood, Charles G.	Sudbury	0	10	6
Guyatt, T. A.	Ely	1	1	0
Hack, Thomas	Swan Village	1	1	0
Hardie, Thomas	Gateshead	1	1	0
Hardie, William	North Shields	2	2	0
Harris, Alfred T.	Market Harborough	1	1	0
Harston, Vernon E.	Norwich	0	10	6
Hawksley, Charles	London	52	10	0
Head, Henry	Winchester	5	5	0
Head, Walter G.	London	1	1	0
Heath, John R.	Stoke-on-Trent	2	2	0
Helps, D. H.	Reading	2	2	0
Helps, Jas. W.	Croydon	7	7	0
Hepworth, Joseph	Edinburgh	10	10	0
Herring, W. R.	Edinburgh	10	10	0
Hill, William	Stalybridge	1	1	0
Hislop, George R.	Paisley	3	3	0
Hislop, Laurence	Uddingston, N.B.	2	2	0
Holliday, John	Hull	5	5	0
Hovey, Arthur C.	Milan	2	2	0
Hoyte, P. S.	Plymouth	2	2	0
Hughes, John	Hoylake	0	10	6
Hughes, Vincent	Smethwick	1	1	0
Hulme, Charles	Uxbridge	1	1	0
Hunt, Charles	London	50	0	0
Hunt, P. C. Holmes	Melbourne	5	0	0
Hunter, W. D.	Rotherhithe	5	5	0
Hutchinson, Walter W.	Barnsley	1	1	0
Iago, Harold	Battle Bridge	2	2	0
Irminger, J. O. V.	Copenhagen	2	2	0
Irons, Geo. B.	Gosport	0	10	6
Irons, Walter R.	Saxmundham	0	10	6
Irving, Daniel	Bristol	2	2	0
Johnston, A. A.	Brentford	10	10	0
Jolliffe, John T.	Ipswich	5	5	0
Jones, F. H.	London	5	5	0
Jones, Harry E.	London	52	10	0
Jones, Stanley H.	London	2	2	0
Kendrick, Harry	Stretford	2	2	0
Keyte, George	Workington	0	10	6
Kincaid, James	Kirkcaldy	1	1	0
Korting, Ernest	Berlin	1	1	0
Lacey, T. S.	London	2	2	0
Langford, William	Longton, Staffs.	2	2	0
Lass, Alfred	London	2	2	0
Lee, Fred	Hinckley	1	1	0
Lees, Herbert	Hexham	2	2	0
Lees, James	Tonbridge	3	3	0
Lessing, Rudolf	London	2	2	0
Lewis, John T.	Wellingborough	2	2	0
Livesey, D. T.	East Grinstead	0	10	0
Lowe, James	Plymouth	2	2	0
Carried forward		£551	1	6

		£	s.	d.
Brought forward		£551	1	6
MacLeod, Andrew M.	Glasgow	1	0	0
MacLeod, James	Greenock	1	0	0
MacPherson	Kirkcaldy	1	1	0
May, Thomas, junr.	Richmond	5	5	0
Meiklejohn, Charles	Rugby	5	5	0
Miles, John	Bolton	2	2	0
Milne, Samuel	Aberdeen	2	2	0
Monk, Levi	Hawick, N.B.	1	1	0
Moon, Philip G.	Bournemouth	1	1	0
Morland, W. S.	Hempsted, Glos.	2	2	0
Morris, Harry.	Jersey	1	1	0
Morrison, John W.	Sheffield	3	3	0
Morton, Robert	London	52	10	0
Napier, J. W.	Alloa, N.B.	2	2	0
Newbigging, Thomas	Knutsford	21	0	0
Newbigging, William	Manchester	5	5	0
Niven, John	Bradford	0	10	6
North, Fred	Stourbridge	5	0	0
Nuttall, Lawrence W.	Gosport	0	10	6
Offord, Charles William	Enfield	2	2	0
Ohren, Charles M.	Lower Sydenham	5	5	0
Onslow, A. W.	Woolwich	0	10	6
Osmond, Frank	Dorchester	0	10	6
Packham, Harry W.	Kingston-on-Thames	1	1	0
Paterson, Robert O.	Cheltenham	15	15	0
Paterson, T. Ormiston.	Birkenhead	5	5	0
Phillips, A. F.	London	10	10	0
Phillips, W. R.	Luton	3	3	0
Pooley, Hubert	Stafford	1	1	0
Potts, Charles	Hyde	1	1	0
Price, Thomas	Walton-on-Thames.	1	1	0
Price, W. E.	Hampton Wick	2	2	0
Price, Walter H.	Reigate	0	10	6
Randall, H. J.	Tottenham	0	10	6
Randall, James	Tottenham	2	2	0
Randell, J. W.	London	1	1	0
Rapkin, Frank W.	Dartford	1	1	0
Reeson, H. S.	London	2	2	0
Reeson, Joseph N.	Beckton	2	2	0
Reid, T. J.	Ballina	1	1	0
Richmond, F. D.	Heckmondwike	0	10	6
Riley, Edwin C.	Swindon	1	1	0
Riley, Harold E.	St. Austell	0	10	6
Ritson, T. N.	London	1	1	0
Runton, J. J.	Hull	1	1	0
Sainsbury, Henry	Trowbridge	0	10	0
Shadbolt, Robert G.	Grantham	1	1	0
Shoubridge, Sydney Y.	Lower Sydenham	10	10	0
Skinner, R. J.	Londonderry	0	10	0
Smallbone, Fredk.	Woodford Green	2	2	0
Smith, Alexander	Glasgow	2	2	0
Smith, B. W.	Walsall	1	1	0
Smith, W. J.	Carlisle	2	2	0
Smithells, Arthur	Leeds	5	0	0
Smythe, Henry	Maidstone	1	1	0
Stevenson, Fletcher Wm.	Coventry	5	0	0
Stevenson, George E.	Long Eaton	1	1	0
Tarratt, Frank P.	Darlington	1	1	0
Taylor, Frank C.	Shanklin	0	10	6
Taylor, Fredk. W.	Shanklin	0	10	6
Terrace, David	Middlesbrough	2	2	0
Thomas, Hanbury	Sheffield	21	0	0
Topley, William W.	Croydon	1	1	0
Townsend, W. W.	Hereford	1	1	0
Trewby, Lawrie	Mill Hill	1	1	0
Troughton, J. H.	Newmarket	1	1	0
Tysoe, Joseph.	East Greenwich	5	5	0
Valon, Arthur	London	3	3	0
Valon, W. A. M'Intosh	London	10	10	0
Waddell, Alexander.	Dunfermline	1	1	0
Walton, W. E.	Bishop Auckland	0	10	6
Ward, Fredk. J.	Knowle	1	0	0
Watson, Jas. C.	Calcutta	3	5	7
Watson, Robert	Doncaster	1	1	0
Webb, Charles H.	Stourbridge	1	1	0
Whatmough, Walter	Heywood	0	10	6
Whyte, James	Seaham Harbour	1	1	0
Williams, Percy E.	London	1	1	0
Wilson, Alexander	Glasgow	10	10	0
Wimhurst, H.	Sleaford	0	10	6
Winstanley, George	Kenilworth	1	1	0
Witten, John	Gt. Yarmouth	1	1	0
Wood, Charles	Bradford	5	5	0
Wood, Samuel	London	2	2	0
Woodall, Corbet	London	52	10	0
Woodall, Harold W.	Bournemouth	12	10	0
Woodall, Henry	Llandudno	10	10	0
Woodall, Henry, Jun.	London	21	0	0
Woodward, William W.	Salford	2	2	0
Young, John	Hull	5	5	0
		£943	7	7

COMPANIES.

	£	s.	d.
Aberystwyth Gas Company	5	0	0
Aldershot Gas and Water Company.	5	5	0
Alliance and Dublin Consumers' Gas Company	100	0	0
Arundel Gas Company	2	2	0
Ascot District Gas and Electricity Company	5	5	0
Ashton Gas Company, Ashton-under-Lyne	15	15	0
Carried forward	£133	7	0

	£	s.	d.
Brought forward	£133	7	0
Barking Gas Company	5	0	0
Bingham Gaslight and Coke Company, Limited	1	1	0
Bishop's Stortford and District Gas Company	5	5	0
Bombay Gas Company, Limited	25	0	0
Bournemouth Gas and Water Company	52	10	0
Brecon Gas Company	2	2	0
Brentford Gas Company	105	0	0
Bridgwater Gaslight Company	5	5	0
Brierley Hill District Gaslight Company	5	5	0
Brighton and Hove General Gas Company	52	10	0
British Gaslight Company	200	0	0
Bromley and Crays Gas Company	21	0	0
Calverley and Horsford District Gas Company	5	5	0
Cambridge University and Town Gas Company	52	10	0
Cannock, Hednesford, and District Gas Company	2	2	0
Cardiff Gaslight and Coke Company	105	0	0
Castleford and Whitwood Gaslight and Coke Company	3	3	0
Cheltenham Gaslight and Coke Company	52	10	0
Chester United Gas Company	10	10	0
Chigwell, Loughton, and Woodford Gas Company	10	10	0
Cirencester Gas Company, Limited	5	5	0
Coatbridge Gas Company	2	2	0
Colchester Gas Company	5	5	0
Commercial Gas Company	315	0	0
Crewkerne Gas and Coke Company	1	1	0
Crook Gas Company	3	3	0
Croydon Gas Company	200	0	0
Danish Gas Company, London	26	5	0
Dartford Gas Company	5	5	0
Daventry Gas and Coke Company	2	2	0
Douglas Gaslight Company	5	5	0
Dudley (Town of) Gaslight Company	10	10	0
Eastbourne Gas Company	5	5	0
East Cowes Gas Company	3	3	0
Elsecar, Wentworth, and Haysland Gas Company.	1	1	0
Elstree and Boreham Wood Gas Company	2	2	0
Enfield Gas Company	26	5	0
Exeter Gaslight and Coke Company	25	0	0
Exmouth Gas Company	1	1	0
Felixstowe Gaslight Company	2	2	0
Frodsham Gas and Water Company	5	5	0
Gaslight and Coke Company	1000	0	0
Gloucester Gaslight Company.	26	5	0
Gosport Gas and Coke Company.	5	5	0
Grantham Gas Company	10	10	0
Gravesend and Milton Gaslight Company.	5	5	0
Great Grimsby Gas Company.	5	5	0
Great Yarmouth Gas Company	5	5	0
Guildford Gaslight and Coke Company	5	5	0
Hampton Court Gas Company	21	0	0
Harlow and Sawbridgeworth Gas Company	1	1	0
Harrogate Gas Company	10	10	0
Harrow and Stanmore Gas Company	10	10	0
Hartlepool Gas and Water Company	10	10	0
Hastings and St. Leonards Gas Company.	21	0	0
Heckmondwike Gas Company.	5	0	0
Herne Bay Gas and Coke Company.	10	10	0
Hexham Gas Company.	5	5	0
High Wycombe Gaslight and Coke Company	2	2	0
Hitchin Gas Company	3	3	0
Hornsey Gas Company.	21	0	0
Ilford Gas Company.	10	10	0
Ilfracombe Gas Company	1	1	0
Imperial Continental Gas Association	250	0	0
Ipswich Gaslight Company	52	10	0
Irthlingborough Gas and Coke Company, Limited	2	2	0
Jersey Gaslight Company	10	10	0
Kelty Gas Company	2	2	0
Kenilworth Gaslight and Coke Company	2	2	0
Kildwick Parish Gas Company	5	5	0
Kingston-upon-Thames Gas Company.	50	0	0
Kirkcaldy Gaslight Company	5	5	0
Lea Bridge District Gas Company	15	15	0
Leamington Priors Gas Company	10	10	0
Leighton Buzzard Gas Company.	2	2	0
Lichfield Gas Company.	2	2	0
Long Eaton Gas Company.	5	5	0
Luton Gas Company.	21	0	0
Maidenhead Gas Company.	10	10	0
Maidstone Gas Company	10	10	0
Malton Gas Company	5	5	0
Mirfield Gas Company	5	5	0
Musselburgh Gaslight Company.	5	5	0
Newark Gas Company	5	5	0
Newcastle-upon-Tyne and Gateshead Gas Company	105	0	0
Newmarket Gas Company.	7	7	0
Newport (Mon.) Gas Company	21	0	0
Northfleet and Greenhithe Gas Company, Limited	2	2	0
North Middlesex Gas Company	10	10	0
Ogley Hay and Brownhills Gas Company, Limited	2	2	0
Oriental Gas Company.	15	15	0
Otley Gas Company	10	0	0
Plymouth and Stonehouse Gaslight and Coke Company	100	0	0
Prescot Gas Company	2	2	0
Pudsey Gas Company	10	10	0
Radcliffe and Pilkington Gas Company	5	5	0
Reading Gas Company	210	0	0
Redcar, Coatham, Marske, and Saltburn Gas Company	5	5	0
Redditch Gas Company	21	0	0
Richmond Gas Company	21	0	0
Ringwood Gaslight and Coke Company	1	1	0
Rochester, Chatham, and Gillingham Gas Company	10	10	0
Carried forward	£3742	3	0

	£	s.	d.
Brought forward	£3742	3	0
Romford Gas Company, Limited	3	3	0
Ross Gas Company	2	2	0
Royston Gas Company	2	2	0
Rugby Gas Company	26	5	0
Runcorn Gas Company	10	10	0
Ryde Gaslight Company	5	5	0
St. Albans Gas Company	10	10	0
St. Austell Gas Company	1	1	0
Salisbury Gaslight and Coke Company, Limited	5	5	0
Scarborough Gas Company	10	10	0
Sevenoaks Gas Company	5	5	0
Shanklin Gas Company	2	2	0
Sheffield United Gaslight Company	200	0	0
Shrewsbury Gaslight Company	10	10	0
Sidmouth Gas Company	2	2	0
Slough Gas and Coke Company	2	2	0
Southampton Gaslight and Coke Company	52	10	0
Southgate and District Gas Company	15	15	0
South Metropolitan Gas Company	2000	0	0
South Shields Gas Company	35	0	0
South Suburban Gas Company	200	0	0
Stirling Gas Company	3	3	0
Stretford Gas Company	21	0	0
Sunderland Gas Company	52	10	0
Taunton Gaslight and Coke Company	5	5	0
Tavistock Lighting, Coal, and Coke Company	1	1	0
Tonbridge Gas Company	5	5	0
Torquay Gas Company	10	10	0
Tottenham and Edmonton Gaslight and Coke Company	200	0	0
Tunbridge Wells Gas Company	21	0	0
Tynemouth Gas Company	21	0	0
Uxbridge Gas Company	25	0	0
Wakefield Gaslight Company	10	0	0
Walker and Wallsend Union Gas Company	10	10	0
Waltham Abbey and Cheshunt Gas and Coke Company	5	5	0
Walton-on-Thames and Weybridge Gas Company	10	10	0
Wandsworth and Putney Gaslight and Coke Company	105	0	0
Warwick Gaslight Company	5	0	0
Waterford (City of) Gas Company	3	3	0
Wellingborough Gaslight Company, Limited	10	10	0
Wellington (Salop) Gas Company	5	5	0
Wells Gas Company	5	0	0
Westbury Gas and Coke Company	1	1	0
West Ham Gas Company	105	0	0
Weston-super-Mare Gaslight Company	10	10	0
Weymouth Consumers' Gas Company	5	5	0
Whittington Gas Company	2	2	0
Worsbrough Dale and Worsbrough Gas and Coke Company	1	1	0
Worthing Gaslight and Coke Company	21	0	0
Wrexham Gas Company	10	10	0
York United Gaslight Company	50	0	0
	£7086	8	0

CORPORATIONS.

	£	s.	d.
Birkenhead Corporation Gas Committee	10	10	0
Birmingham Corporation Gas Committee	105	0	0
Bradford Corporation Gas Committee	52	10	0
Burslem Corporation Gas Committee	2	2	0
Burton-on-Trent Gas and Electricity Committee	5	5	0
Chard Corporation Gas Committee	1	1	0
Darwen Corporation Gas Committee	10	10	0
Devonport Corporation Gas Committee	1	1	0
Doncaster Corporation Gas Committee	10	10	0
Glasgow Corporation Gas Committee	105	0	0
Hereford Corporation Gas Committee	5	5	0
Heywood Corporation Gas Committee	3	3	0
Huddersfield Corporation Gas Committee	10	0	0
Keighley Corporation Gas Committee	10	0	0
Longton Corporation Gas and Electricity Committee	2	2	0
Manchester Corporation Gas Committee	105	0	0
Ossett Corporation Gas Committee	5	5	0
Salford Corporation Gas Committee	52	10	0
Southport Corporation Gas Committee	10	10	0
Stafford Corporation Gas Committee	5	5	0
Stockport Corporation Gas Committee	10	10	0
Stoke-on-Trent Corporation Gas Committee	2	2	0
Warrington Corporation Gas Committee	5	5	0
	£530	6	0

SOCIETY OF BRITISH GAS INDUSTRIES.

Amount subscribed through the Society of British Gas Industries by the following members and others (others marked *) :—

Anti-Vibration Incandescent Light Company.	Otley
Braddock, J. & J.	Oldham
Cannon Iron Foundries, Limited	Deepfields
Carron Company	Carron
Clapham Bros., Limited	Keighley
Clark and Co., S.	London
Clayton, Son, and Co., Limited	Leeds
Clerk, Dugald	London
Davis Gas Stove Company, Limited.	London
Dempster and Sons, Limited, Robert	Elland
Drakes Limited	Halifax
Edward Dean, and Beal	London
*First Dutch Bog Ore Company, Limited	Leamington
Fletcher, Russell, and Co., Limited.	Warrington
Fry, Charles E.	Leamington
Gas Meter Company, Limited.	London
Gibbons Bros., Limited	Dudley
Gibbons, Junr., Limited, B.	Dudley
Glover and Co., Limited, George	London
Glover and Co., Limited, Thomas	London
Glover, J. William	London
Harris and Pearson	Stourbridge
Imperial Stove Company	Leamington
Ingram and Kemp, Limited	Birmingham
Jenkins and Co., Limited, W. J.	Retford
*Laidlaw and Son (Edinburgh), Limited, R.	Edinburgh
Leeds Fire Clay Company, Limited.	Wortley, Leeds
Main, Limited, R. & A.	London
Marsh and Thorp	Manchester
Metropolitan Gas Meters, Limited	Nottingham
Milne and Son, Limited, James	Leeds
Mobberley and Perry, Limited	Stourbridge
National Gas Engine Company, Limited	Ashton-under-Lyne
Orme and Co., G.	Oldham
Pearson, E. J. & J.	Stourbridge
Richmond Gas Stove and Meter Company.	Warrington
*Sawer and Purves	Manchester
*Sturtevant Engineering Company, Limited	London
Sugden and Co., F. C.	Leeds
Sugg and Co., Limited, William	London
*Tangyes, Limited	Birmingham
Taylor and Co., Joseph	Bolton
Tilley Brothers	London
Townson and Mercer	London
Walker, Limited, C. & W.	Donnington
Waller and Son, George	Stroud
West's Gas Improvement Company, Limited	Manchester
Williams and Co., J. E.	Manchester
Williamson, Cliff, Limited	Little Bytham
Wilson and Mathiesons, Limited	Leeds
Winstanley, George	King's Norton
Vale and Sons, Limited, Thos.	Stourport

	£	s.	d.
Amount received from the Society	433	11	0
Amount subscribed direct to Institution of Gas Engineers by Members of the Society	137	1	0
	£570	12	0

Memorandum, re Society of British Gas Industries.

	£	s.	d.
Total received from the Society	433	11	0
Deduct amount from non-members	32	11	0
	401	0	0
Add received from the members of the Society paid direct to the fund	137	1	0
Total subscribed by members of the Society	£538	1	0

OTHER MANUFACTURERS, COAL OWNERS, &c.

		£	s.	d.
Abbott, M., and Co.	Limehouse	3	3	0
Aird and Sons, John	London	52	10	0
*Alder and Mackay	Edinburgh	5	5	0
Balfour, Henry, and Co., Limited	Leven	4	4	0
*Donkin, Bryan Co., Limited	Chesterfield	5	5	0
Carless, Capel, and Leonard	Hackney Wick	10	10	0
Chemical Engineering Company and Wilton's Furnace Company		1	1	0
Davis, S. Nicholls, Limited	Finsbury	1	1	0
Dougall, Jas., and Sons	Bonnybridge, N.B.	5	0	0
Edgar, William	Hammersmith	1	1	0
Forbes, Abbott, and Lennard, Limited	Shoreham	10	10	0
Foster, E., and Co.	London	21	0	0
*Glenboig Union Fire Clay Company		5	5	0
Lambton Collieries, Limited	Newcastle-on-Tyne	25	0	0
Lux (Friedrich) Ludwigshafen		5	5	0
*Moffats Limited	London	1	1	0
New Inverted Gas Lamp Company		10	10	0
Newton, Chambers, and Co.	Thorncliffe	50	0	0
Norden, Julius, Limited	London	1	1	0
*Parkinson and W. & B. Cowan, Limited (Cowan Branch)		5	0	0
*Parkinson and W. & B. Cowan, Limited (Parkinson Branch)		5	0	0
Simmance and Abady	Westminster	5	5	0
Speakman and Sons, Philip	Liverpool	10	10	0
Spencer, Chapman, and Messel	London	10	10	0
Stephenson, Clarke, and Co.	London	26	5	0
Stott, James, and Co.	London	2	2	0
Sykes, Henry, Limited	London	2	2	0
Torbay Paint Company	London	10	10	0
While, Samuel, and Son	London	2	2	0
*Willey and Co., Limited	Exeter	5	5	0
*Wright, John, and Eagle Range	Birmingham	105	0	0
Yorkshire Silica Firebrick Company	Oughtibridge	5	0	0
		413	3	0
Less Members of Society of British Gas Industries		137	1	0
		276	2	0
Add amounts sent to Society of British Gas Industries by non-members		32	11	0
		£308	13	0

* Members of the Society of British Gas Industries.

DIRECTORS OF GAS COMPANIES, MEMBERS OF GAS COMMITTEES, AND OTHER SUBSCRIBERS.

		£	s.	d.
Adamson, C. R.	London	1	1	0
Amos, D.	Canterbury	2	2	0
Barker, John	Leven	1	1	0
Bevis, A.	Surbiton	2	2	0
Birchenough, J. H.	London	1	1	0
Borastin, John	Lower Sydenham	5	5	0
Braddock, Joseph	Oldham	5	5	0
Bradshaw, W. G.	Crawley Down	21	0	0
Braine, C. W.	Wandsworth	1	1	0
Brookes, A. W.	London	1	1	0
Carpenter, G. W.	London	5	5	0
Carpenter, R. Forbes	London	2	2	0
Cash, William	London	2	2	0
Chattel, J. van Rossum de	Amsterdam	1	1	0
Clark, H. N.	Stratford	1	1	0
Clift, Leslie E.	London	3	3	0
Corrie, Major-General W. T.	Ealing	1	1	0
Crowfoot, Dr. W. B.	Beccles	1	1	0
Darlington, F. A.	London	1	1	0
Depree, F. Templer	Exeter	5	5	0
Derbyshire, J. N.	Nottingham	1	1	0
Dickson, Alexander	St. Johns	5	5	0
Doesburgh, N. W. van	Leiden	1	1	0
Duckham, A. M.	London	12	10	0
Duff, William	Morecambe	1	1	0
Dunn, W. T.	London	0	10	6
Field, S. S.	E. Greenwich	5	5	0
Fitzmaurice, R. B.	London	1	1	0
Flannery, Sir J. Fortescue	London	5	5	0
Gardiner, R. S.	London	21	0	0
Garrard, J. S.	Eastbourne	1	1	0
Gas World, The Proprietors of The		15	15	0
Glanfield, T.	Exeter	5	5	0
Glasgow, A. G.	London	21	0	0
Gray, Albert, K.C.	London	3	3	0
Groschke, E.	London	10	10	0
Harcourt, A. Vernon	Ryde	5	0	0
Hazeldine, Fredrick	S. Godstone	2	2	0
Helps and Son, F. A.	London	5	5	0
Hill, Miss Davenport	Oxford	2	2	0
H. J. D.		2	2	0
Hounsom, William A.	Brighton	21	0	0
Hunter, Walter	Westminster	5	5	0
Hurry, Dr. Jamieson B.	Reading	1	1	0
James, H. N. W.	East Greenwich	1	1	0
Jessell, Sir Charles J., Bart.	London	1	1	0
Jones, R. Hesketh	London	10	10	0
Key, W.	Glasgow	1	1	0
King, Walter	London	21	0	0
Leigh, Hon. Sir E. Chandos, K.C.B.	London	1	1	0
Lewis, Colonel H. le Roy, D.S.O.	London	1	1	0
Light, Jabez	Kenley	5	5	0
Carried forward		£260	11	6
Brought forward		£260	11	6
Lucas, Arthur	London	1	1	0
Lyon, C. G.	Knottingley	1	1	0
Maltster, William	Lower Sydenham	2	2	0
Mann, William	Brentford	3	3	0
Newton, H. Goodwin	London	1	1	0
New Zealand Express Company		3	3	0
Nisbet, J. Wylie	London	5	5	0
Palmer, J. Horsley	London	5	5	0
Pelton, R.	Tunbridge Wells	1	1	0
Penny, S.	London	1	0	0
Podmore, A. E.	London	1	1	0
Puplett, Henry	Westminster	1	1	0
Rayner, H.	Westminster	2	2	0
Reeds, Joseph	Matlock Bath	1	1	0
Rostron, Laurence	Beddington	10	10	0
Simpson, Stephen	Exeter	5	5	0
Snelgrove, A. G.	Stratford	5	5	0
Stephenson, Mrs. Andrew	London	1	1	0
Strutt, G. H.	Belper	5	0	0
Taylor, Joseph	Bolton	3	3	0
Terry and Co., John	London	5	5	0
Tetley, C. F.	Leeds	50	0	0
Tindall, Robert	London	1	1	0
Topley, E.	Tottenham	1	1	0
Vivian, Henry, M.P.	London		10	6
Walker, Joseph	Huddersfield		10	0
Waller, W. G.	Lower Sydenham		10	6
Watson, D. Milne	Westminster	5	5	0
Webber, W. H. Y.	Teddington	2	2	0
Westcott, J. T.	Westminster	21	0	0
Westlake, H. J.	Exeter	5	5	0
Westlake, W. N.	Exeter	1	1	0
Weston, James	Eastbourne	10	10	0
Wilkin, Fred	Wadhurst	1	1	0
Wilkinson, Leonard R.	Lyndhurst	1	1	0
Williams, A. Canning	Reading	1	1	0
Wilson, J.	Huelva		10	6
Wilton, John	Bow	2	2	0
Wyllie, Robert	Lower Sydenham		10	6
Yarrow, A. F.	Blackheath	10	10	0
		£440	19	6

SUMMARY OF CONTRIBUTIONS.

Number of Subscribers.		£	s.	d.
14	Institutions, District Associations, and Junior District Associations	342	1	6
226	Members of the Institution	943	7	7
159	Gas Companies	7086	8	0
23	Gas Committees of Corporations	530	6	0
54	Members of the Society of British Gas Industries	538	1	0
30	Other Manufacturers, Coal Owners, &c.	308	13	0
92	Other subscribers	440	19	6
599		£10,189	16	7

PHOTOMETRIC TESTINGS AT THE REICHSANSTALT IN 1908.

The report on the work done during last year at the Imperial Physical Technical Institute at Charlottenburg—as given in the "Zeitschrift für Instrumentenkunde"—states that 129 Hefner lamps in all were examined and certified, making, since the Institute undertook the certification of these lamps in 1893, a total of 1639 Hefner lamps which have received its certificate. Of this total, 954 have been fitted with the optical flame measurer, 464 with the Visier, and 221 with both types of flame measurer. Among other apparatus tested, may be mentioned eighteen incandescent gas-lamps with upturned mantles, twenty-two with one or more inverted mantles, two lamps with one inverted and six horizontally placed mantles, two incandescent burners of special construction, forty acetylene burners, fifteen incandescent acetylene burners, and four photometers. The most favourable result obtained for the duty of inverted gas-burners was a consumption of 1 litre of gas per Hefner mean spherical illuminating power (= 25·9 candles per cubic foot). Experiments have been carried out with several types of "Flicker" photometer. These tests showed that the "Flicker" photometer for the differences of colour obtaining in the tests presented no advantage in regard to speed and certainty of the setting over the usual methods of measurement when the tests were made by practised observers. It was found that when there was a difference of colour, observers having somewhat different sensitiveness to light of different colours deviated in their settings in the same direction with the "Flicker" photometer as with ordinary balance or contrast photometers. These observations have, it is stated, refuted the contention of Messrs. Simmance and Abady, which on theoretical grounds is not very probable—that with the "Flicker" photometer, persons who have a different sense of colour generally obtained the same settings. It may be pointed out in this connection that Rood in the year 1899 used the "Flicker" photometer for the purpose of detecting differences in the sensitiveness to light of different colours of different observers. During 1907 Tufts established on the spectrometer with the "Flicker" photometer curves for the distribution of the sensitiveness to light over the spectrum with twenty-one different observers—some with normal vision and some colour-blind. These curves showed considerable and characteristic deviations one from another.

Prize Winners in the City and Guilds Examinations.

We have received from the Superintendent of the Department of Technology of the City and Guilds of London Institute (Sir Philip Magnus, M.P.) a list of the prize winners at the last technological examinations. The following are the names of the successful candidates in the subjects named, and the centres at which they studied:—

Gas Engineering.

Honours Grade—First prize (£3 and a silver medal), William Arthur Howie, Rutherford College, Newcastle-on-Tyne.

Ordinary Grade—First prize (£2 10s. and a bronze medal), Arthur Edward Bullen, Plymouth Technical School; second prize (£1 10s. and a bronze medal), Arthur G. V. Berry, East Ham Technical College; third prize (a bronze medal), Douglas Cleave Cross, Regent Street Polytechnic, London.

Gas Supply.

Honours Grade—First prize (£3 and a silver medal), Harry Staniforth, Derby Municipal Technical College.

Ordinary Grade—First prize (£2 10s. and a bronze medal), Henry Burgess, Derby Municipal Technical College; second prize (£1 10s. and a bronze medal), George Twist, Sheffield University; third prize (a bronze medal), Francis Leigh, Oxford City Technical School.

Coal Tar Distillation and Products.

Honours Grade—First prize (£2 and a silver medal), Arthur Edmund Woodhead, Leeds University.

Ordinary Grade—First prize (£1 10s. and a bronze medal), Ernest Arthur Bearder, Leeds University.

The money prizes in "Gas Engineering" and "Gas Supply" are given by the Goldsmiths' Company; those in "Coal Tar Distillation and Products" by the Salters' Company.

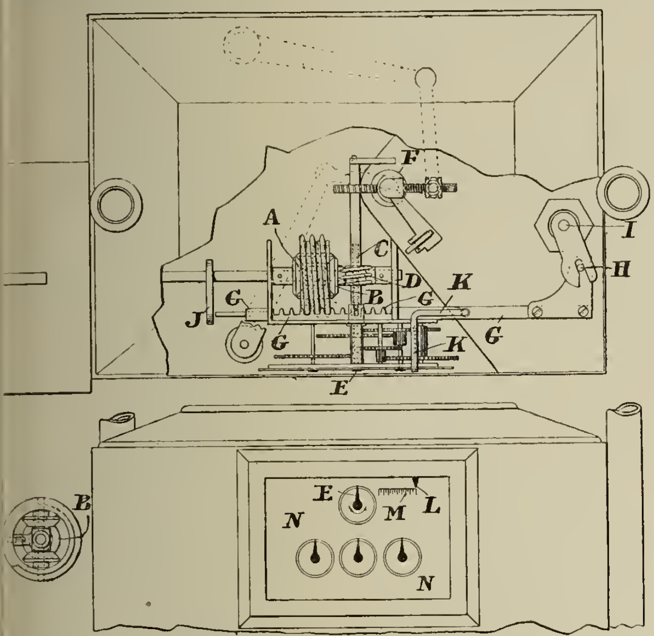
REGISTER OF PATENTS.

Coin-Freed Gas-Meters.

Glover, T., of Queen Victoria Street, E.C.

No. 15,923; July 27, 1908.

This invention relates to the class of coin-freed gas-meters in which e toothed operating wheel is moved round by a coin inserted in the in-receiver; the stem of the toothed wheel operating in one direction ırough a train of epicyclic gearing and other mechanism) the gas- lve to open it—the gearing and mechanism being returned through e action of the bellows to close the gas-valve to shut off the supply.



Glover's Coin-Freed Gas-Meter.

To the axle carrying the operating wheel is fixed a bevel-pinion A, ıeshing with two other bevel-pinions mounted on axles projecting inside drum in the same axial line. Also mounted on the axle of the operat- ıg wheel is yet another bevel-wheel B, with a toothed wheel C fixed) it and meshing with a worm D on the shaft, which connects the unit and E of the index mechanism with the worm F operated by the ellows. The drum has a worm cut on its outer periphery; and this ears with a rack G connected at one end with the valve controlling the ıpply of gas to or from the meter—preferably by a pin H on a bracket onnected to the rack G riding in a slot of an arm of the valve-rod I.

On the axle of the operating wheel is mounted an arm J, which acts s a stop when the rack G is moved to come into its path, and thus pre- ent over-winding or strain of the mechanism by the action of a coin. rom the rack projects an arm K, the point L of which travels on an ıdex M, to indicate the amount of gas unconsumed; and the index is referably on the ordinary index plate N.

On the insertion of a coin, the operating wheel is turned, and its axle hrough its fixed bevel-wheel A) operates the two bevel-wheels on the rum and revolves them; the worm moving the rack G end-on and pening the valve by turning its rod I—the bevel-wheels of the drum ıding over the bevel-wheel B, which is loose on the shaft of the ope- ating wheel. This operation is continued until the full number of oins for which the mechanism is constructed has been passed into the pparatus, when the rack G—on the last coin being inserted and the ppliances operated—will have been placed at such a position that the rm J comes against it, and prevents further movement of, the operating wheel. The arm K passes to the index, indicating the full amount of as to be consumed, or this indication may be obtained by ordinary gear nd a revolving hand or pointer.

On burners being lighted, the bellows commence operation and, hrough the worm F operating the spindle connecting the index, will, hrough the worm on the spindle, revolve the toothed wheel C and the ıevel-wheel B loose on the axle; and this bevel-wheel gearing with the wo bevel-wheels on the drum will revolve the drum, which moves the ack G back to close the valve, and when the valve is fully closed the neter stops.

Securing the Ends of Service-Pipes to Mains.

Parkinson, B. R., of Leighton Buzzard, and Woodall, H., of Palace Chambers, Westminster.

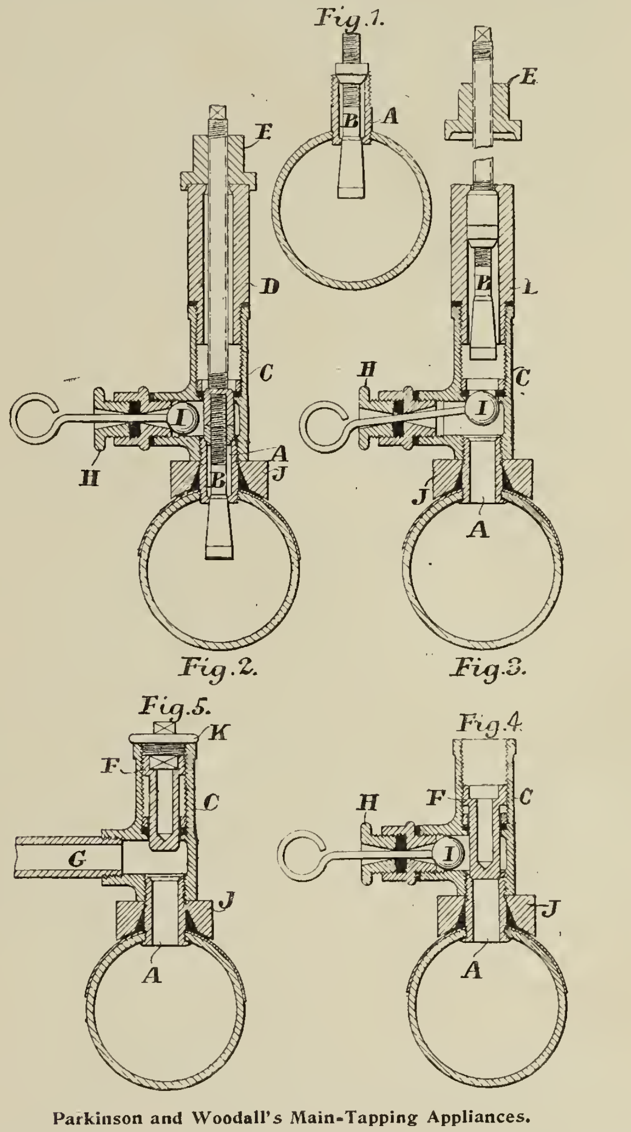
No. 19,628; Sept. 18, 1908.

This invention relates to the screwed and internally beaded nipple lescribed in patent No. 23,414 of 1907—see "Journal" for Nov. 17, 1908, p. 502.

The first part of the invention consists of a special construction of expanding mandrel devised with the object of enabling existing machines or drilling and tapping mains under pressure and inserting ordinary nipples therein to be utilized with the above-mentioned form of nipple. The second part of the invention consists of a valved junction piece or errule, adapted, after a saddle-piece has been passed round the nipple, o be screwed on to the nipple, so as to enable the expansion of the nipple to be effected by the mandrel without the escape of the fluid under pressure.

Fig. 1 is a transverse section of the nipple, with the lower mandrel section screwed into a main. Fig. 2 shows the parts of the nipple and junction-piece in the positions they occupy prior to the commencement of the expanding operation. Fig. 3 illustrates their positions when the operation has been completed. Fig. 4 shows the mandrel and its sleeve removed and the outlet of the nipple closed preliminary to the removal of the self-seating valve. Fig. 5 shows the junction-piece connected up to a service-pipe.

The nipple A is, as described in the 1907 patent, provided with an internal beading and external screw threads. B is a stem (forming the lower part of the mandrel) provided at its lower end with a coned expanding head, and at its upper end with a screw thread. A nut engages with this screw thread, and when screwed against the seating at the upper end of the nipple, it draws the coned head of the mandrel section against the internal beading. The upper part of the mandrel has a screwed boss at its lower end, which engages with the upper end of the screwed portion of the lower mandrel section. C is a junction piece or ferrule, of somewhat similar nature to that generally used for effecting connection between an ordinary nipple and a service-pipe. The lower branch of this ferrule is formed with a screw-thread, which engages with the screw-thread on the upper end of the nipple A; while the upper branch is provided with a screw-thread which receives the lower end of a long sleeve D. This sleeve (equivalent in its general function to that described in the 1907 patent) serves not only as a means for taking the thrust of a nut E by the rotation of which the expansion of the nipple is effected, but also acts as a stop for limiting the upward movement of the whole of the mandrel when the latter is



Parkinson and Woodall's Main-Tapping Appliances.

forced upwards on the completion of the expanding process. The screw thread also engages with the screwed head of a plug F, which is adapted, as usual, to bear against the coned seating in the upper end of the nipple. The third branch of the junction-piece or ferrule C is formed with a screw thread adapted not only to receive, as usual, the end of the service-pipe G, but also a cap or plug, consisting of a stuffing-box and a screwed gland H formed with flaring holes, serves as a fluid-tight support for the rod of a self-seating ball valve I, adapted (when pushed inwards by its stem) to be forced against a seating in the interior of the ferrule C in the line with the bore of the nipple.

The expanding mandrel and junction piece or ferrule are used in the following manner: The lower section B of the mandrel is secured within the nipple A with its coned expanding head pressed against the internal beading of the nipple, and its nut against the seating at the upper end of the nipple. A machine of ordinary construction is secured to the main, and a hole is drilled and tapped in the usual manner. After this, the nipple containing the lower half of the mandrel is screwed by the machine into the tapped hole, as in fig. 1. When the machine has been removed, the upper part of the mandrel is screwed on to the lower section B, a saddle-piece J, together with a gutta-percha ring, is passed over the nipple, and the junction piece C, containing the self-seating valve, is screwed on to the nipple. The long sleeve D is then screwed into the upper branch of the junction piece, and the nut E, engaging with the screw upon the upper half of the

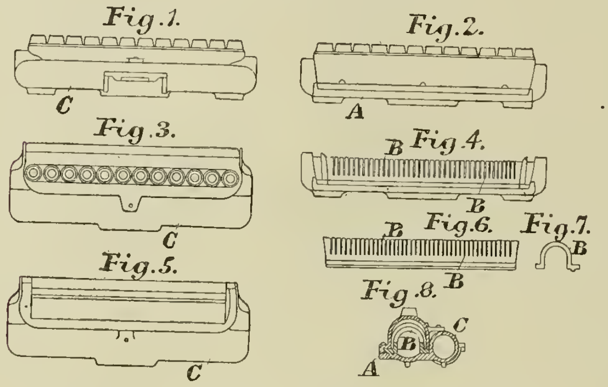
mandrel, is rotated till it bears against the top of the sleeve. Expansion of the nipple is then effected by further rotation of the nut. As soon as the expansion of the nipple is completed, the mandrel will be forced upwards by the pressure; the boss of the upper part of it coming to rest against the top of the interior of the sleeve, as shown in fig 3. When this has occurred, the ball valve I will be pushed inwards, so that it can be pressed by the fluid against the seating in the interior of the ferrule C. The mandrel and its sleeve can now be removed and the plug F screwed by a key into the junction piece and on to the facing on the upper end of the nipple—the stem of the plug, in passing through the washer, forming a fluid-tight joint with it, and displacing the ball-valve. The position of parts will then be as shown in fig. 4. The stuffing box is then unscrewed from the third branch of the ferrule C and the ball valve removed. This branch is then ready to be connected at any time to the service-pipe. When this has been effected, the plug F will be raised to admit fluid into the junction piece, and the upper branch of it will be permanently closed by a plug K or a cap.

Atmospheric Gas-Burners.

Fletcher, Russell, and Co., Limited, Neil, A., and Fletcher, T. W., of Warrington.

No. 25 979; Dec. 2, 1908.

This is an improvement on the atmospheric gas-burners described in patent No. 18,896 of 1894, in which a chamber is provided between the mixing-chamber and the nozzles, by means of a diaphragm parallel to, and forming a part of, the mixing-chamber—the diaphragm having slits or orifices formed in it through which the mixed gas and air passes into the chamber between the diaphragm and the nozzles, and thence to the nozzles. Prior to this invention, the mixing-chamber and diaphragm have been cast in one piece, and necessitated holes having to be drilled in the ends of the diaphragm in order to clean out the sand; the holes then requiring to be plugged. The object of this invention is to enable this to be avoided, and to obtain a smooth bore within the diaphragm, "which thereby improves the combustion."



Fletcher, Russell, and Co.'s Atmospheric Gas-Burner.

Fig. 1 is a back view, fig. 2 a front view, and fig. 3 a plan of the burner. Fig. 4 is a front view of the burner with the nozzle-cap removed. Fig. 5 is a plan showing the burner without the nozzle-cap and diaphragm. Fig. 6 is a front view, fig. 7 an end view of the diaphragm, and fig. 8 a transverse section of the complete burner.

The diaphragm B has slits in it, separate from the main portion A of the burner and the mixing-chamber C, and the diaphragm is formed to fit on the base A, and the ends to fit against the outlet apertures of the mixing-chamber. By these means the diaphragm can be cast and completed separately from the main portion or base of the burner on which it is fitted, and can at any time be easily removed for cleaning the slots.

Manufacturing Incandescent Mantles.

Severin, L., of Hagen, Westphalia.

No. 5463; March 6, 1909.

This invention consists in the mantle (cut to a suitable length) being trimmed at its upper edge with a tape or ribbon through which a non-combustible thread is drawn in such a manner that the edge of the mantle, on the thread being tightened, is gathered in, and thus the head of the mantle is formed.

The working operations are: The turning-down of the edge of the mantle, the sewing of it firmly to the mantle, and the gathering-in of the tape. The drawing through it of the non-combustible cord is replaced by the sewing on of the edging tape provided with the drawn-in thread and by gathering-in the tape. Incandescent mantles made in this way are said to be considerably cheaper, and at the same time more uniform; they also possess "the special advantage that they are strengthened and are made more rigid at their upper edge by means of the edging tape (which may be of any desired thickness) than is the case with the well-known forms."

Tottenham Public Lighting.—At the meeting of the Tottenham Urban District Council last Tuesday, the General Purposes Committee reported that they had referred to the Engineer a letter from the Tottenham and Edmonton Gas Company, to the effect that they were unable to make reductions in the present prices for street lighting, and submitting proposals for installing an improved lantern and burner over the district, subject to the Council entering into an agreement for ten years. It was resolved to accept the Company's terms for the lighting, maintenance, &c., of the public lamps for the year ended June 30, 1910. With regard to the suggestion to instal improved lamps, the Engineer is in communication with the Company, and the subject is receiving the attention of the General Purposes Committee.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill read a second time and committed: Prestatyn Urban District Council Bill.

Bill reported, with amendments: Blackwood Gas Bill.

Bills read the third time and passed: Derwent Valley Water Board Bill, Gas Provisional Order Bill, Gas and Water Orders Confirmation Bill, Pontypridd Water Bill, Swinton and Mexborough Gas Board Bill.

The opposition to the Northallerton Water Bill has been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bill read the first time and referred to the Examiners: Gas and Water Orders Confirmation Bill.

Lords Bill read a second time and committed: Risca Urban District Council Bill.

Lords Bill read the third time and passed: Alliance and Dublin Consumers Gas Bill.

GASLIGHT AND COKE COMPANY BILL.

House of Lords Committee—Friday, July 16.

(*Before Lord* Clifford of Chudleigh, *Chairman, the Earl of* Stradbroke, *Lord* Digby, *Lord* Wynford, *and Lord* Glantawe.)

The Bill promoted by the Gaslight and Coke Company to authorize the acquisition by them of the undertaking of the West Ham Gas Company, and to confer further powers on them, came before the above Committee to-day.

Mr. Balfour Browne, K.C., Mr. Danckwerts, K.C., Mr. Honoratus Lloyd, K.C., Mr. Reginald Neville, and Mr. Davidson represented the promoters (Messrs. Dyson and Co., Parliamentary Agents). Mr. Freeman, K.C., and Mr. E. Morten, K.C., appeared for the West Ham Corporation (Messrs. Hilliarys, Agents), against the Bill. Mr. Forbes Lankester, K C. (Messrs. Rees and Freres, Agents), represented the West Ham Gas Company.

The Chairman, at the outset of the proceedings, intimated that one of the Committee—Lord Digby—was interested in the Gaslight and Coke Company. He did not know whether counsel considered that a bar to his taking part. No objection was, however, raised.

Mr. Balfour Browne, in opening, mentioned that the promoting Company was an amalgamation of several Companies. They now supplied over an area of 62 square miles; and the total capital employed was £27,500,000. The ordinary stock represented £15,161,545. The objects of the Bill were very simple—merely to absorb the West Ham Gas Company, who supplied an important area to the East of London. The district of the Gaslight and Coke Company was essentially urban in character; and except on the north-west, which was not fully built up, most of the area where they were supplying was fully occupied and incapable of any great expansion. The Gaslight Company at present had a margin of plant which was idle. The West Ham Company, on the other hand, had a large district which was rapidly growing, and they were nearly at the end of their tether. In 1902, they got a Bill authorizing the purchase of land in East Ham, and the expenditure of a large sum of money—£250,000—on the construction of works on the site. They had put up a gasholder; but had not yet erected any considerable works there. They would, however, if they stood alone, soon have had to contemplate bigger works and a large expenditure of capital; while the Gaslight Company had at their disposal at the present time surplus plant which was not fully occupied. The West Ham Company had only a margin of 13 per cent. to-day; and so far as their retorts were concerned, they had only a margin of 10 per cent., which, at the normal rate of increase in the West Ham district, would only last for two years from the present time. Their works, though good, were not up to modern standards, and some remodelling would have to be done when they passed into the hands of the Gaslight Company. In their view, this remodelling should be set about at once. Among the disabilities of the West Ham Company was that they had to barge all their coal at a cost of 1s. a ton; while the promoters' works were on the river at Barking and at Beckton, where coal was brought alongside by steamers. They proposed to spend upon the plant in East Ham about £250,000. This would be saved by reason of the amalgamation. Their surplus retort power was equal to a supply of 7 million cubic feet; and this would be brought into use whenever they got to West Ham and supplied there. The evidence would show that there would be considerable economies resulting from the amalgamation. The terms of purchase had been agreed between them and the West Ham Gas Company. The effect was really to give the West Ham shareholders practically the money there were receiving to-day. The amount beyond that, he thought, was a very small figure of £2053, which, spread over the ordinary stock of the Gaslight Company came to 0·01d. per 1000 cubic feet sold. The testing of gas would go on as before. There was no official testing-place in West Ham; and the Corporation asked for two. He hoped, however, to be able to convince the Committee that this was entirely unnecessary. There was only one opponent to the scheme—the Corporation of West Ham. The West Ham gas-works at present were in West Ham. When the Bill was before the House of Commons, the Corporation feared that as they were going to amalgamate with West Ham they might do away with the works altogether, and that the rateable value of them might be lost to West Ham. It was also feared that employment would be taken away

rom workers in the district if the works were abolished. The Com- nittee of the House of Commons thought that some protection should e given, and they suggested, on passing the preamble of the Bill, that clause should be put into it providing that the works should be continued for a certain time. The promoters brought up a clause; out it did not meet with the approval of the Corporation of West Ham, who also submitted a clause, which was accepted. The clause nade it obligatory upon the Gaslight Company to carry on works of similar capacity on the site in West Ham for ten years. He should have thought this would have satisfied West Ham, because it was their own clause. But apparently they were not content, as they had again petitioned against the Bill. In paragraph 10 of their petition, they said: "Your petitioners allege and are prepared to prove that the whole scheme of the Bill has been conceived solely in the interests of the Directors of the West Ham Gas Company, and of the stockholders of that Company, and of the Gaslight and Coke Company, and without any regard whatsoever being had to the necessities or welfare of the public or the consumers of gas in the districts supplied by such Companies, and submit that no case of public necessity or advantage can be made out for the Bill." The West Ham Company were supplying districts quite outside the area of the Corporation. There were places like Wanstead and Woodford, very growing districts, which were not in West Ham at all. When they were reading the petition, they were only speaking of a part of the district of the West Ham Company. There was a large and important area, East Ham, which was also entirely outside the limits of the Corporation. The Corporation area was only one-third of the total area covered by the Gas Company. He joined issue upon this allegation in the petition. They had no doubt considered the interests of their shareholders; but he contended that the interests of the public and of the consumers of gas had been very carefully considered also, and that there would be a distinct advantage to the gas consumers, both for private and public purposes, by reason of the amalgamation. In paragraph 11, the petitioners said: "The borough is the largest district included in the present area of supply of the West Ham Gas Company, and the manufacturing works of that Company are situate within the borough. For years past it has been the practice of Parliament to promote the purchase by local authorities of the gas undertakings within their districts." Then paragraph 13 said: "Your petitioners allege that the area of supply of the Gaslight and Coke Company as at present existing is as large an area as should be allowed to any one Company, and the powers already possessed by the Gaslight and Coke Company, your petitioners submit, should not, in the interests of the public, be in any way extended or enlarged, and that therefore the Bill should not be allowed to pass into law." He did not know how they came to the conclusion that 62 square miles, which was the area of their supply, was the magic point at which to stop; and he could not conceive why they should not supply in this area too. The larger the area, the larger the concern, the cheaper the gas supply ought to be. The petitioners also objected to clause 4, and the whole scheme of the Bill generally. They were quite contented, and desired to remain in the district of the West Ham Company. It was quite obvious, however, that they would suffer if they remained in the hands of the West Ham Company. That Company came to Parliament in 1892 for authority to buy 40 acres of land in East Ham, and spend £250,000. If this £250,000 was spent, the interest on it must be paid by the gas consumers. At the present time the Gaslight Company had at their Beckton works plant ready for the supply of the increasing wants of the district, so that they would be worse off if they remained in the hands of the West Ham Company. In paragraph 15, the petitioners said that the Gaslight Company had not been well managed in the past, and that the concern was loaded with an excessive amount of obsolete and unremunerative capital. As a fact, they had taken steps by which all this obsolete capital would be written off. He believed it would amount to something like £1,000,000; so that the complaint which was now made was entirely unfounded. In paragraph 16 the petitioners said that the price charged for gas was most unreasonable and excessive; and that this was caused to a large extent owing to past mismanagement and paying interest on unremunerative capital. He thought they would be able to show that, as they were supplying at the present time in their area a gas of higher illuminating power than the West Ham Company, they were charging a little more. When the illuminating power was reduced, however, the consumers would get the gas at precisely the same price as the West Ham Company were now charging; and the Corporation of West Ham would get it 4d. cheaper than they were at present paying to the West Ham Company. Paragraph 17 read: "Your petitioners opposed the Bill before the Committee of the House of Commons, and for their protection a clause was inserted dealing with the existing works of the West Ham Gas Company, such clause being in the following terms: '(30) For the protection of the mayor, aldermen, and burgesses of the County Borough of West Ham, the following provision shall have effect—the Gaslight Company shall not close the existing works of the Company situate within the borough for the period of ten years from the date of transfer, but during such period the said Company shall continue the manufacture of gas at such works and carry on the same as a manufacturing gas-works, substantially on the same scale as they were carried on by the West Ham Company during the year prior to the introduction of the Bill for this Act.'" This was their own clause, and was adopted by the Committee in their behalf. Then they said in paragraph 18: "Your petitioners are apprehensive that one result of the sale of the undertaking to the Gaslight and Coke Company will be that the works of the West Ham Gas Company referred to in paragraph 11 hereof will be closed after the expiration of the time limit of ten years." This was their own clause.

Mr. Freeman interjected that it was only their clause so far as it was a clause to carry out the decision of the Committee. It was not all they asked for.

Mr. Balfour Browne, continuing, said it was in the words that Counsel himself brought up: "Referred to in clause 30 of the Bill, and that there will be a material decrease of the rateable value of the undertaking within the borough and a corresponding loss to your petitioners, who are the rating authority for the district." He could not quarrel with the clause because he brought up the Bill with it in; but he was bound to say that his own view was that it was a monstrous clause. To say that for ten years this Company were to keep up works which might possibly be abolished with advantage, merely because a rating authority said they did not want to lose the rates, seemed to him a very curious departure in an entirely wrong direction. The interests of the consumers of gas were the primary interests. Supposing they could reduce the price of gas by abolishing these works, of course the consumers would get the benefit. But the rating authority stepped in and succeeded in inducing a Committee of the House of Commons to stereotype the works for ten years; and now they wanted their Lordships to go further and say they should be even continued for a longer period. He should object to this very strongly. The whole idea of amalgamation was to supply gas as cheaply as possible. If their Lordships said, "You are to amalgamate and yet not to have the benefits of amalgamation for all time," he thought it would be a very serious disadvantage to the consumers of gas in London. Paragraph 19 was: "Your petitioners submit that, if the Bill should be allowed to pass into law, the protection afforded by clause 30 is insufficient to meet the necessities of the case, and that provision should be incorporated therein for the purpose of compelling the Gaslight and Coke Company to keep open the present works of the West Ham Gas Company as at present for a period considerably in excess of ten years." He joined issue, and asked the Committee not to continue it one second beyond ten years. The principle of ten years, in his opinion, was altogether wrong; but as the Committee of the House of Commons put it in, he was bound to keep it in. In paragraph 20 it was contended by the petitioners that if the Bill were allowed to pass it would have the effect of increasing the numbers of the unemployed in the borough. It was nonsense to ask a Committee of Parliament to say that works which were wasting money should be kept open merely for the benefit of employing people. That seemed to be absolutely wrong and unsound. At the same time, apparently, the House of Commons took a different view, and said that for ten years at any rate they were to do this; and for ten years the workmen would have the benefit of clause 30—with the works carried on substantially as they were to-day. But he asked their Lordships not to go further in this direction. Any unremunerative works might be forced upon a company to be continued for all time, merely for the sake of employing workmen. They could never shift their works. There was always a rating authority; and if it became necessary to destroy any works in any part of London, that rating authority would say: "Oh no, you are going to transfer that to a place which is more convenient to you, but you will deprive us of rateable value; you will deprive the workmen of work." They never could move. He thought this Bill had gone a very long way in a wrong direction; and he would ask their Lordships not to go an inch further. Paragraph 21 read: "The provisions of the Bill with respect to the testing of gas are most unsatisfactory and totally inadequate for the due protection of your petitioners and other consumers in the borough. Under these provisions, the testing would take place at the Beckton works and at Leytonstone only, both of which places are far away from the centre of the part of the borough to be supplied by the Company." As to the provisions with regard to testing, the testing-place was decided after a fight in 1902. Gas when it travelled long distances through pipes lost some of its illuminating power; and the object of gas companies was always to have the gas tested as near to the works as possible, before it had lost its illuminating power. In this particular case, Leytonstone, he thought it was, put upon the West Ham Company an obligation to test at a long distance from their works. Therefore, they had a very satisfactory test of the quality of the gas supplied by the West Ham Gas Company. Paragraph 22 read: "If the Bill should be allowed to pass into law, it should only be upon the further condition that provisions are first embodied therein to the following effect: (1) The Gaslight and Coke Company to provide and maintain, in addition to the testing-place at Leytonstone, which has to be maintained under the West Ham Gas Act, 1902, two additional testing-places fitted with all apparatus—one in Canning Town and one in Stratford. (2) The gas supplied to be of the same degree of purity, quality, and heating power as required in the Metropolis, and subject to the same tests. (3) The tests to be under the control, as heretofore, of the Gas Examiner appointed by your petitioners, and not of the Metropolitan Gas Referees, who have no jurisdiction within the borough. (4) The tests to be made at any time of the day, and an average of three tests at intervals of not less than half-an hour to be taken as representing the illuminating power of the gas at that testing when the result is below the standard." The two points of his learned friend Mr. Freeman were these—that clause 30, which kept these works there for ten years, should be extended to a further time. He would resist this. The second was with regard to testing.

Mr. Freeman: I am entirely opposed to the Bill.

Mr. Balfour Browne said he had read the petition carefully; and those were the only grounds his friend raised—first, that clause 30 was not sufficiently long (he said it should be extended in time), and, secondly, he said the provisions for testing were not satisfactory.

Mr. Freeman remarked that clause 10 was the one they relied upon mainly.

Mr. Balfour Browne said this paragraph was a general statement which he would entirely negative by evidence. He would show that it was not conceived in the interests of the shareholders of the two Companies only, but in the interests of the public. The two chief points were that his learned friend wanted to keep the works in West Ham for a longer period than ten years, both for the benefit of the rates and for the benefit of the unemployed. He also wanted to have a testing-place at some point convenient to him. This was the whole case; and he would call evidence to prove that it was not in the interests merely of the shareholders, but in the interests of the public and the consumers of gas.

Mr. *Corbet Woodall*, the Governor of the Gaslight and Coke Company, examined by Mr. Balfour Browne, said the quantity of gas sold in 1908 was 22,000 million cubic feet. They had sold a million tons practically of coke; and they used—allowing for the proportion of oil employed in gas making—the equivalent of 2 million tons of coal. The capital was divided into preference and ordinary shares. The nominal capital now was £27,500,000. Of this, however, £13,000,000 was due to conversion; so that the actual capital employed was about

£15,000,000. The chief object of the Bill was to absorb the West Ham Gas Company. The area of the Gaslight and Coke Company was a very large one; but it was almost wholly urban. In recent years the extension of London had been to the suburbs, and, consequently, away from the district served by them. There was a cordon right round their district, so that they had no room for expansion, and the danger was that they would be practically stifled as the little remaining space was built over. They were losing to a very considerable extent their larger consumers to the electric light, and they would be a decaying Company unless they had the opportunity of going into fresh fields to find business. Apart altogether from the West Ham Gas-Works, his Company had rateable hereditaments of a very considerable extent in West Ham; and they were contributing to the rates there. At their Bromley works they had surplus power to the extent of about 7 million cubic feet of gas a day. This was very nearly the maximum output of the West Ham Gas-Works; so that they could really supply practically the whole of West Ham from these works, and they were very convenient. As to the 40 acres authorized to be purchased by the West Ham Company in 1902, if they were left alone and erected works there, it would be outside West Ham altogether from the point of view of rating. He thought there could be no doubt the scheme was altogether in favour of West Ham. At Beckton, the Gaslight Company had a surplus to the extent of 10 million cubic feet a day. It was an economical thing, of course, in the interests of the public to use this surplus plant. If the West Ham Company were left alone, they had selected this site for their new gas-works outside West Ham altogether; and West Ham would lose the rateable value of these works. The present rates paid by the Company to West Ham appeared to have amounted to about £22,000 per annum. In districts beyond West Ham, like East Ham, Wanstead, and Woodford, the population was growing. It was in this area that the future development for gas supply would take place. He did not say that there was no room for further extension within West Ham; but the districts they desired were those comparatively unoccupied ones to which he had referred. In London, practically the output of gas by the Gaslight and Coke Company had been at a standstill for two or three years; while the districts round about were increasing—Tottenham, for instance, where the average rate of increase was from 8 to 10 per cent. per annum. Asked if the West Ham Company could in their present position meet the growing wants of the district for any length of time, witness said the maximum producing power of the West Ham works was a little over 9 million cubic feet per day. The actual maximum output in West Ham last year from the works was 8½ millions, or, taking an average of some three days, it was over 8 millions; so that the actual margin was about 10 per cent., while the rate of increase of the Company had averaged over 9 per cent. per annum for the last five years. New works could not be built within two years; and, consequently, it was quite clear that the West Ham plant was fully occupied at the present time. Having bought the site at East Ham in 1902, they proceeded to build a new gasholder upon it, which was very much needed. The holder had cost them about £70,000. This naturally relieved the works at West Ham very much; but they had not yet begun to erect manufacturing works there. If they were to set up manufacturing works in this area, they would have to spend additional money to the extent of from £250,000 to £300,000. The situation was this: The West Ham Company had a business which would shortly call for larger works and more capital. The Gaslight Company had at their disposal surplus works which were sufficient to meet the wants of West Ham without any further works. In regard to the increase of consumption in West Ham, the average for the last five years had been over 9 per cent. In 1904, the increase was 11·5 per cent.; in 1905, 8·2 per cent.; in 1906, 11·3 per cent.; in 1907, 10·7 per cent.; and last year, which was an unfavourable one for gas-works, 4·17 per cent. The West Ham works could not stand this for more than two years at the outside. It was necessary for a gas-works not only to have sufficient plant for the requirements of the supply, but also to have a reserve of producing power. It would be impossible to find a better position than the Gaslight Company's Beckton works, in the Barking district, for getting coal to be used for the purpose of manufacturing gas. It was an excellent one. They could berth six steamers at the same time at their piers, and discharge 10,000 tons of coal a day. He thought it would be a little over 1s. per ton to have coal barged up to the new site. As to the terms of purchase, the West Ham Company had their capital divided into ordinary stock and preference stock and debentures. The preference was a 5 per cent. stock. The Gaslight Company gave for this £125 of the Company's 4 per cent. stock; so that the holder of this stock got the same return. With the debenture stock they gave for every £100 of 4 per cent. £133 6s. 8d. of the Gaslight Company's 3 per cent. stock, again giving exactly the same return. In regard to the ordinary stock, for every £100 they were giving to the Company £121. The standard dividend of the West Ham ordinary stock was 5 per cent.; the standard dividend of the Gaslight Company was 4 per cent. These, in his view, were very fair terms. The extra dividend given to the shareholders of the West Ham Company would amount to £933 per annum. This was equal to 2s. 1d. per cent. upon the capital, which seemed to him a very mild premium indeed. It was only right to say that, after the Bill was drafted, the standard price was reduced from 3s. 3d. to 3s. 2d. This put the West Ham Company in a less favourable position, and in an agreement with the Directors of the West Ham Company the Gaslight Company raised the payment for the ordinary stock from £118 to £121. But this extra £3 was to be got by the distribution from the reserve fund of the Company; so that it would not affect the dividends of the Gaslight Company or the charge for dividends on the consumers. The shareholders had foregone what they might have divided; and of this sum, they were paying to the West Ham Company the £20,000 odd. The £933 spread over the Gaslight Company's stock was hardly to be named in a fraction. It was about one-hundredth of a penny per 1000 cubic feet. One penny per 1000 feet on the gas supplied by the Gaslight Company amounted to about £90,000 a year. Besides this, they proposed to cancel the unissued stock of the West Ham Company. They would raise money at a lower rate by issuing some of their 3 per cent. debentures. This would again be a benefit to the consumers; the cheaper they were able to raise their capital the better. With regard to the testing, it was proposed to continue the present mode and also the apparatus as now employed for gas testing in the West Ham district. If the West Ham Council would be better pleased to have a station within their own area (say, at their town hall), the Company had no objection to closing the station at Silvertown and giving them a testing-station in their own town hall. These stations cost about £200 a year, and they did rather grudge the extra cost. The gas of the Company was tested in the most severe way three times every day, whereas he believed the West Ham Corporation were content to test the gas about once a month. He thought the testing-place that was in the district of Wanstead was amply sufficient for their protection. Two testing-places would be ridiculous. The witness proceeded to deal with the compensation to the retiring Directors of the West Ham Company, based on six years' fees, and compensation to officers by arbitration—mentioning, respecting the latter, that with all the servants of the West Ham Company the years of their service counted as years of service with the Gaslight Company in regard to pensions and generally as to their status for promotion, &c. In clause 31, the standard price was to be reduced by 2d., of which 1d. was in consequence of a reinstatement in 1907 of the meter-rents. The reduction of the other penny represented a sacrifice of from £80,000 to £90,000. Having alluded to the proposed reduction of the standard from 16 to 14 candles, witness explained that the Company was one of the oldest in Great Britain; and from time to time works that were originally established for the supply of gas had been abandoned. They were abandoned at times when the Company were not able to write off the capital from their accounts; and, consequently, there had accumulated an amount of capital that was not represented by plant and works. This was recognized constantly by Parliament when application was made for further powers; and it was arranged in 1905 that the Company should write off £1,000,000 sterling out of their dividend from the capital account. They were doing it at the rate of £20,000 a year, and had now written off £100,000 of the amount. It was not accurate, as stated in the petition, that this amalgamation was entirely in the interests of the shareholders and stockholders of the two Companies. Under the scheme which governed the price and the dividends of the Company, it was impossible that one could be benefited without the other sharing to the extent of about 5¼ to 1. The consumers got the big advantage of any reduction in economies that they could make, while shareholders got the rest. As to their management, in the last few years they had effected considerable economies. They had closed down three of their most costly works, and were manufacturing at the more economical ones. Considerable savings had been effected in other ways. As compared with 1904, when their price was 3s. per 1000 feet, they had reduced the price of gas to the extent of more than £250,000 per annum. Closing down expensive works would have been impossible if the rating authorities in the districts had a clause similar to clause 30 in the Bill.

In cross-examination by Mr. Freeman, witness said that the capital on their books works was, in round figures, £28,000,000. The actual figure for the nominal addition on conversions was £13,615,000. The West Ham Company had a capital of £1,500,000 in round figures; and their nominal addition on conversion was £307,000. In 1903 they had a considerable amount of obsolete capital. The £250,000 that had been alluded to was to be expended at East Ham. In his opinion, it was the intention of the West Ham Company to transfer their undertaking to East Ham. Whether at East Ham or at West Ham, works for the growing business must be provided. He thought the business would grow in the West Ham district at the rate of about 7 or 8 per cent. Judging by the experience of last year, he considered the maximum ill-effect of electrical competition had been nearly reached. Gas was recovering to a certain extent what it had lost to electricity. Further capital expenditure on new works would be required. But amalgamation would save the whole of this expenditure. As to the clause which was put in for the protection of the West Ham Corporation, as to keeping the works open, he expressed his willingness to concede this clause when he gave evidence before the Committee of the House of Commons; but he did not think it a right one. It was a very large concession made in the hope of securing an unopposed Bill. Speaking personally, he was most anxious, when the Gaslight Company started their duties in West Ham, that they should commence on good terms with the Local Authority. He did not agree to carry the clause a little further—namely, that workmen in the employ of the West Ham Company should be kept on at these works subject to the clerical staff having perhaps to be transferred to Bromley.

Mr. *J. L. Godlee*, the Chairman of the West Ham Gas Company, examined by Mr. Honoratus Lloyd, said there was £600,000 extra capital authorized by the Act of 1892, of which all but £115,000 had been raised. This would run them for two or three years, not more. By the Act of 1892 his Company were authorized to manufacture gas on land at East Ham, which they had recently purchased; and a gas-holder had already been erected. They had been advised that they must very soon put up additional works there, and additional gas-holders, to enable them to supply their district. Probably with the present works some small increase of gas might be taken up. The estimate given to them for the new works was about £250,000. His Board were approached by the Gaslight Company; and they learned that they were in a position of having a sufficient margin of works to take up their increase and save the cost of the new works. Under these circumstances, his Directors thought that, in the interests of all, they should consider the terms which the Gaslight and Coke Company were offering. Eventually terms were agreed; and they were those of the present Bill. If they were to go on as at present without amalgamation, and had to face the large capital expenditure in order to deal with the increased demand, the result almost certainly would be to keep his Company back for some time. He thought the terms agreed were fair and equitable. They had had in view the welfare of the consumers in West Ham, and made it a *sine qua non* that the prices charged to them should not be raised. It was one of the very decided terms of all their bargains that the price they should charge to all consumers should be the same price after the amalgamation. They had also had in mind the position of their employees; and, in his view, the result of the amalgamation would be in their interest. He knew that the Gaslight

Company agreed to the clause as to the non-closing of the works for the period of ten years.

In cross-examination by Mr. Freeman, witness said it was true that it was never contemplated transferring their works altogether from West Ham to East Ham. The question had never been looked at. Their first intention was that they were wanting an outlet—finding additional room. The question as to what the ultimate result would be had never been considered by the Board. What they had done with the Gaslight Company was to ensure that they should charge the same price that they were charging now.

Mr. *T. Goulden*, the Chief Engineer to the Gaslight and Coke Company, also gave evidence in support of the amalgamation, which he thought would benefit the West Ham consumers by relieving them from the increased charge due to the expenditure of capital. It would relieve the Gaslight Company by bringing into work capital now lying idle, and it would assist the rating of West Ham.

Monday, July 19.

On the resumption of the proceedings to-day,

Mr. *Goulden*, in cross-examination by Mr. Freeman, stated, as to the average increase of the gas for the year 1908 being only 4 per cent., that this was quite an exceptional year. Almost all companies suffered a small subtraction from their normal rate of increase. West Ham had gone down within a few years previously to less than 2 per cent., and yet they got up to an average of 9 per cent. for the last five years. They believed the competition with the electric light which the West Ham Company was subject to had reached its zenith. He did not think they were going to hurt the Company more than they had done. He saw a probability of the Company continuing to expand at about the rate of 7 per cent.

Mr. *D. Milne Watson*, the General Manager of the Gaslight and Coke Company, stated the public advantages which the Bill would produce. With regard to the ratepayers—the public lighting authorities—West Ham, instead of having a single works supplying them, would in future have two or three works. There would be no danger of breakdown. At the present moment they were entirely dependent upon a supply of gas from the West Ham works. In future, they would not only have the West Ham works, but Beckton and Bromley, and if necessary, other works the Company had. These works at the present time had a surplus of very many millions, which would afford a supply for several years to come. With regard to the public lighting of West Ham, the difference between 2s. 6d. and 2s. 2d. represented a saving to the local authorities, who were at present served by the West Ham Gas Company, of £1167 a year. They got their gas cheaper. This was irrespective of the question of maintenance. With regard to other authorities outside West Ham in their district, the Bill would mean a reduction of 2d. per 1000 cubic feet for all public lighting all over London as served by his Company. This would mean an annual saving to the local authorities in London of £7717. Taking both ratepayers in West Ham and in London served by his Company, there would be a saving of nearly £9000. In addition to this, there would be a saving on the south side of the river, by reason of the price coming down there, of another £9375. Owing to the amalgamation, and also to their previous Acts of Parliament they would have to charge the same price south of the river as the South Metropolitan Company; the effect being that consumers south of the river would get a reduction of 2d. per 1000 feet. This worked out at £9375; and the three items together made £18,000 odd advantage to the public per annum. With regard to the consumers north of the Thames, if the Bill became law, the Gaslight Company had entered into an agreement with the West Ham Gas Company to reduce their price, as from new year next, to 2s. 8d. per 1000 cubic feet. The annual amount paid to pensioned workmen by the Gaslight Company was now £22,000; and the workmen of West Ham would get the advantage of this pension scheme. The Directors had instituted a co-partnership scheme under which the workmen and officers of the Gaslight Company would get a very considerable advantage; and the West Ham workmen would, he presumed, be admitted on the same basis as their own men, and would participate in future benefits. The officers of the Companies had also been provided for under the Bill; and the past service of the officers of the West Ham Company would count in claiming their pensions. They would have to contribute in future; but there would be no back contributions. The witness produced a clause with regard to the testing-station of West Ham.

In cross-examination by Mr. Freeman, witness said the saving on gas was subject to the question of maintenance.

Mr. *H. E. Jones* testified to the fact that there was an absolute necessity, having regard to the present demand, and the present capacity of the West Ham Gas-Works, for future further works.

In cross-examination by Mr. Freeman, witness admitted that, at the present time, the Gaslight Company's gas was the dearer. The Company had, however, spent a good deal of capital at times when all plant was much dearer. The introduction of the hot-blast iron founding reduced the cost of gas-pipes to the more modern companies very considerably. They would not find any of the older companies with such low capital as the modern companies.

Mr. Honoratus Lloyd said this closed the case for the Bill.

Mr. Freeman, in addressing the Committee for the Corporation of West Ham, said their sole interest was to preserve as cheap, as efficient, and as satisfactory a supply of gas to the consumers within their district as they could manage. On the other hand, the primary interest of the Gaslight and Coke Company was to do the best they could on a broad principle—the best they could for their shareholders in the first instance, and, of course, incidentally, for their customers, so as to keep up their business. But the interest of the Company was not the same as the Corporation; and the two propositions he was going to put before the Committee were these: That the Gaslight and Coke Company ought not, having regard to all that they now knew about them, to be permitted to come and take possession of the West Ham district and supply against their wishes the West Ham consumers; and, secondly, that there was no benefit which they were going to receive directly in West Ham, apart from the shareholders and Directors, by this amalgamation. On the admission of the Governor himself, this was a Bill for the relief of the Gaslight and Coke Company, and a Bill to enable them to obtain a further district where they might develop and make up for those customers who were being taken away from them by the fact that they owned a very crowded district. He submitted that the Committee would view with a certain amount of suspicion a Bill promoted on these grounds, and for these reasons, by a trading concern such as the Gaslight and Coke Company was. The Company was the largest of all the London Gas Companies; it was the most over-capitalized of all the London Gas Companies; and it was the result of numerous amalgamations. They found that in London the larger the Company the more expensive the gas; and the Gaslight and Coke Company, being the largest of the Companies, they found them on the top of the tree as regarded charging rates.

The Chairman: Are we correct in taking your general dictum? We quite understand that the Gaslight Company are charging as much as, certainly not less than, the other Companies; but are we to take it that the larger the company the dearer the gas?

Mr. Freeman: Certainly, in London.

The Chairman: I am not disputing the point that this Company are dearer than the others; but your assertion is that the larger the Company the dearer the gas.

Mr. Freeman said he would not go in for a generality. He would confine himself to saying that this Company, which was the largest of the London Gas Companies, was also the dearest. And inasmuch as they were the dearest, and they at present had a Company who were supplying cheaper—although he knew the Gaslight Company proposed to charge them the same as the West Ham—they were not going to gain anything so far as regarded the price of gas by their coming in. Counsel proceeded to deal with the point of the writing-off by the Gaslight Company of £1,000,000 of obsolete capital at the rate of £20,000 a year, and contended that they were not a Company which, *primâ facie*, Parliament would entrust with a new district that did not want them and could not gain any benefit from them. They had been branded by a Committee of Parliament as a Company who had not managed their affairs well. At the present time, West Ham had a Company with whom they were perfectly satisfied; for they supplied them at a reasonable price and with a satisfactory gas. He could not see any single advantage which West Ham was going to get from the West Ham Company being taken over by the Gaslight Company.

The Chairman: Is not your case rather that you are suffering a disadvantage? Two Companies come before us to ask that they may amalgamate naturally. Should not the argument rather be that you are going to get some disadvantage?

Mr. Freeman: Yes; we are.

The Chairman: If you remain precisely the same, where do you come in?

Mr. Freeman replied that they came in in this way. They had at the present time the local gas-works fixed in their own neighbourhood, employing their own men, and doing trade in their own district. They were going to have a Company brought in whose very reason for coming in was that they had spare plant elsewhere to which they wanted to remove their gas-works gradually, and take away from them the very benefits they had from having them in their midst.

The Chairman: You are not the owners of the gas-works?

Mr. Freeman: No; we are the municipal authority. We have the rating of the gas-works; and we have the employment of the people in our town.

The Chairman: They are employed by the gas people; they are not employed by you.

Mr. Freeman: No; but we have to deal with the unemployed when they are thrown out of work.

The Chairman: Oh, that is the argument?

Mr. Freeman: That is one of the arguments.

The Chairman: That is the only damage you have shown yet.

Mr. Freeman said they would lose the rateable value if they moved the works. They were the only persons who could protect the consumers, who were perfectly satisfied with the thing as it stood now. Parliament had to see in a matter of this kind that there was some advantage to the public and to the consumers.

The Chairman: I will not go so far as that. I think you are carrying the argument too far when you say there is to be a public advantage. That there is to be no public disadvantage, I admit, is a legitimate argument. But if the public are not injured, I do not see why we should interfere.

Mr. Freeman said they had regarded it as their public duty as the municipal authority to look after the people who were in their charge, and there was nobody to protect the consumers except the municipal authority. They were simply transferring an obligation from the West Ham Gas Company to the Gaslight Company. This would not be the slightest benefit; while, on the other hand, it would be a damage to the people of West Ham. He submitted that the Gaslight Company ought to satisfy the Committee that it was not merely for the commercial interests of that Company, but also in the interests of the people who were going to consume the gas, that this amalgamation should take place. Otherwise, it was simply and purely a commercial arrangement between the two Companies; and the West Ham Corporation, having very carefully considered the matter, as the public authority bound to protect the consumers, asked their Lordships not to sanction the provisions of the Bill.

After consultation in private,

The Chairman said: The decision of the Committee is that they find the preamble proved.

The consideration of clauses was later on proceeded with.

Mr. Freeman said there was one clause upon which he wanted to take the opinion of the Committee. There were two others, however, which were merely a matter of drafting, but they presented a good deal of difficulty. The only matter which he need trouble them with arose from clause 30 of the Bill:

> The Gaslight and Coke Company shall not close the existing works of the West Ham Company situate within the borough for the period of ten years from the date of transfer; but during such period the said Company shall

continue the manufacture of gas at such works and carry on the same as a manufacturing gas-works substantially on the same scale as they were carried on by the West Ham Company during the year prior to the introduction of the Bill for this Act.

His first amendment to this section was to substitute for the words "ten years" "twenty years." The Company had given it in evidence that on previous occasions whenever they had amalgamated with other companies they had never closed the works under 26 years; and the West Ham Corporation were very anxious to secure as long as possible these works being carried on in their borough, both for the sake of the rateable value, and still more to secure the employment of a great number of people at them. He did not think there could be any serious objection to it. Then the second amendment, supposing the Committee had altered the clause to 20 years, or any other period, or even supposing they left it at ten years, would follow on.

(2.) The Gaslight Company shall not, during the period referred to in subclause 1 hereof, to any material extent reduce the staff, either workmen or clerical, employed at such works below the average staff employed during the year prior to the introduction of the Bill for this Act.

(3.) After the expiration of the said period, the said Company shall not close the said works, or discontinue the manufacture of gas thereat, or materially reduce the number of workpeople employed in connection with the works, without the written consent of the Corporation, but that consent shall not be unreasonably withheld. If any question arises whether such consent is unreasonably withheld, such question shall be decided by the Board of Trade after taking into consideration all the circumstances of the case, and any representations made to them, either by the Company or the Corporation; and in the event of the Board deciding that the consent is unreasonably withheld, they may make an Order, which they are hereby empowered to make, authorizing the closing of such works.

(4.) In the event of the Company making application to the Corporation for their consent, under subsection 3 of this section, the same shall be deemed to be refused unless it be given under the hand of the Town Clerk of the borough within two months from the receipt of such application.

These amendments spoke for themselves. They were amendments which they understood were practically agreed between the parties, or, at any rate, that the Gaslight Company raised no objection to; but apparently now they did. Apart from this, he submitted that they were eminently reasonable amendments. The question was whether they should continue to employ these people at the works, and if at the end of the period they asked to close them, they could refuse, and then the matter had to go to the arbitration of the Board of Trade to decide which of them was right.

Mr. Honoratus Lloyd said the thing that surprised him most was his learned friend's closing words—that he thought the Gaslight Company had no objection. He could not understand what ground he had for making such an assertion. In the other House, the West Ham Corporation expressed their fear that if the Bill was passed the Gaslight Company might immediately close the works. They said that on previous amalgamations they had not done so, and for many years they had carried on the works; although, of course, it was impossible to see what could not be foreseen—what improvements and alterations might take place. But they said in effect: "In order to make it to you perfectly clear that we have no immediate intention of doing so, we are quite content to say we shall not close our works for a time." The Committee took this view, and said it was right; and his friends then brought up the clause which was in the Act, to carry out the decision of the House of Commons Committee. Now it was asked in the first place to change the period of ten years to some such period as twenty years, against which they had the strongest objection, for the reason that, although they were anxious to do all they could to meet the borough of West Ham, and always had been, it was impossible to see what improvements might take place in (say) a period after ten years; and to tie the hands of a Company, who, after all, were merely public servants, for a period of over ten years, he ventured to submit would not be in accordance with public policy. But it did not even stop there, because his friend said then, although the clause as it stood in the Bill provided that for ten years they should carry on the manufacture substantially on the same scale as before, he now asked that he should go on to say that, whatever the period, 10 or 20 years, they should be obliged to maintain, or not to vary to any material extent, the staff of workmen or clerical employees. Again, whatever improvements in manufacture might turn up, whatever savings might be made for the benefit of the consumers of gas, they were to go on keeping the same clerical staff and the staff of workmen whatever might happen. This could not be in the interests of public policy. Then, again, it was to be not 10 or 20 years, but something indefinite, and everlasting disputes as to whether or not it could be shown that their works ought to be conducted in a particular way or not, to the satisfaction of the Corporation. Nobody had ever given such an undertaking—not to close works upon amalgamation. Never had the Gaslight Company upon any previous occasion been asked to give any such undertaking. In this case they were willing to be bound by the clause as it now stood—that they should not close the works for a period of ten years from the date of transfer, but should continue to manufacture at West Ham substantially on the same scale. He asked their Lordships to say that this was at least as far as manufacturers carrying on a public duty ought to be asked to go, and not to put on them a further obligation with reference to that. By the transfer the officers of the West Ham Company all came into their scheme, and all shared the benefit of their undertaking; but if this was done, the officers and men in the Gaslight Company were to suffer possibly, if improvements were brought about of which they could not take advantage, in order that other advantages might be given to other people. He submitted that it was certainly not in public policy that any such provision should be made as this; there was no precedent whatever for it. The clause as it now stood went further than Parliament had ever yet gone; and it would be unreasonable to ask that the Gaslight Company should be bound by any further and far more stringent terms.

The Chairman, after private consultation, said: The Committee are unable to agree to the amendments proposed to clause 30.

Later on, it was announced that an agreement had been arrived at with the West Ham Corporation on all outstanding points.

The Chairman formally went through the clauses, and the Bill was ordered to be reported to the House, with amendments.

LEGAL INTELLIGENCE.

Robertsbridge and Hurst Green Gas and Water Company.

Last Friday, before Mr. Justice Eve, in the Chancery Division of the High Court of Justice, Mr. Bray moved, on behalf of the plaintiff in the action of *Meadows v. Robertsbridge and Hurst Green Gas and Water Company*, for the appointment of a receiver and manager of the undertaking and assets of the Company. He said the plaintiff was a debenture-holder, and held his debentures subject to the condition that the principal money became payable if the Company made default for three months in the payment of interest. The interest due on the 24th of March had not been paid by the 24th of June, and the plaintiff gave notice accordingly. There being no opposition, his Lordship appointed Mr. Davies receiver and manager until the 31st of October.

East Sussex Gas and Water Company.

In the Chancery Division of the High Court of Justice last Friday, Mr. Justice Neville had before him two motions for the appointment of a receiver and manager of the East Sussex Gas and Water Company, Limited, on the applications of Mr. Bowman and Mr. Walmesley. Mr. Ward Coldridge said the motions had already been before his Lordship; he (Counsel) appearing in one instance and Mr. Ashton Cross in the other. The Company had now withdrawn their instructions to his learned friend; and he must therefore press his petition for the appointment of a receiver. This was a motion in a debenture-holders' action; the trust deed providing for such an application when the debenture interest was three months overdue. As it was now more than three months in default, he asked for one order on both motions. Mr. Ashton Cross agreed. A receiver was thereupon appointed, and also a manager for three months.

Company Sued for Putting in a Gas-Stove.

At the St. Austell County Court, on Monday last week, before his Honour Judge Granger, Mr. S. Bennallack, a retired farmer, sued the St. Austell Gas Company, Limited, for 10s., damage alleged to have been caused in putting a gas-stove, with the necessary pipes, in one of his cottages. Mr. H. E. Riley, the Engineer, Manager, and Secretary of the Company, appeared in answer to the summons. The plaintiff said the stove was put in without his consent; and as soon as he discovered it, he ordered the Company to take it out and remove the pipes. They accordingly did so. He said he was very much afraid of gas, and never allowed it in his cottages. His Honour remarked that the action should have been brought against the tenant of the cottage, who was really responsible for any damage which had been caused. Mr. Riley said the stove was fixed, at the request of the tenant, in November, 1907. Next day the plaintiff asked them to remove it in March this year; and they did so. Plaintiff produced a law book, and, amid much laughter, proceeded to read extracts therefrom bearing upon the subject of trespass. In the result, judgment was given for the Company, with costs.

A Westcliff Gas Consumer's Account.

Last Friday week, a Bench of Magistrates were called upon to decide a dispute which had arisen between the Southend Gas Company and one of their consumers—Major Henry Healey, who resides at Westcliff. The matter came up on a claim by the Company for £12 8s. 2d. for gas supplied. In support of the claim, Mr. Cox explained that Major Healey, who had a number of gas-fires in his house, disputed one quarter's account on the ground that the consumption of gas registered was so abnormal as to render it absolutely impossible for it to be correct. He wrote stating that he could not but think there must have been some considerable error, and that he was confident no more gas was consumed than in the corresponding quarter. The meter had since been tested, and found to be 2·91 per cent. fast. In this connection, Major Healey wrote to the Company stating that, in view of the admittedly faulty condition of the meter, it was likely to be even more at fault from time to time, and was, therefore, unreliable for sustaining the Company's claim. The Company, however, refused to make any reduction whatever beyond the allowance of the 2·91 per cent., and a further sum of 3s. 6d. In the case of a defective meter, it got faster and faster, or slower and slower progressively. It did not become fast, stop, and then go on again. The Secretary (Mr. J. T. Randall) and the Engineer (Mr. F. Clark) having given evidence bearing out this statement, Mr. Drysdale, for the defence, said that, while Major Healey did not in any way wish to shirk payment, the figures for the quarter were so startling that he thought the matter required careful investigation. The amount charged was three or four times more than for the corresponding quarter. The Company were monopolists, and they had certain privileges; but they also had certain duties which must be discharged. Therefore, the responsibility of keeping the meter in order fell on the Company, and not on the consumer. Major Healey did not deny he had used some gas; but he contended that it was impossible for him to have consumed the whole amount charged against him. He was quite willing to pay what the Justices considered an equitable sum. Defendant said that he had offered the Company £5; but this had been refused. The Clerk (Mr. A. J. Arthy) pointed out that the defendant had made a contract with the Company agreeing to accept the result of the meter-test. Mr. Drysdale, however, submitted that there was some inherent flaw in the meter, not disclosed by the test. The onus of proving that the meter was registering correctly fell on the Company. The Bench ultimately made an order for the payment of the amount claimed, without costs.

The Directors of the National Gas-Engine Company, Limited, have resolved to pay an interim dividend at the rate of 20 per cent. per annum on the ordinary shares for the six months to June 30.

MISCELLANEOUS NEWS.

PUBLIC LIGHTING OF THE CITY OF LONDON.

We have received from the City Engineer (Mr. Frank Sumner, M.Inst.C.E.) his report on the works executed by the Public Health Department of the Corporation of London during the year ending Dec. 31, 1908. It furnishes the following particulars in regard to the public lighting.

The number of incandescent gas-lamps (including experimental lamps) paid for by the Corporation at the end of the year was 2730; being a decrease of 35 during the twelve months, accounted for by the removal of the lamp-columns in Fleet Street and a number of lamps in the side streets adjacent to main thoroughfares. The larger proportion of the ordinary burners (1988) consumed 4·25 cubic feet of gas per hour; the consumption of most of the high-pressure lamps being 10 and 20 cubic feet. On the 15th of October, the Court of Common Council agreed to the proposal of the Gaslight and Coke Company to relight Fleet Street experimentally by means of high-pressure inverted gas-lamps of the Keith type, on brackets fixed to the fronts of the houses, and projecting 5 feet over the footpaths, in lieu of the 36 double-burner upright incandescent lamps on the footpaths, and the two high-pressure lamps on rests at the eastern and western ends of the thoroughfare and opposite Fetter Lane. The change necessitated the laying down of a 6-inch high-pressure main in the centre of the roadway, with branch services to each lamp; the pressure being obtained from the Company's power-house in Essex Street, Strand. The pressure is 54 inches of water, or 4 inches of mercury; the gas consumption per lamp being at the rate of 25 cubic feet per hour, with an illuminating power of 1500 candles. The inclusive annual upkeep of the lamps, with gas at 2s. 5d. per 1000 cubic feet, is £16 10s. each. The work was carried out during November and December; and the lamps were brought into use on the 24th of the latter month. Owing to the more efficient lighting of the eastern end of Fleet Street, and the introduction of flame arc lamps in Ludgate Circus, it was found possible to remove the four gas-lamp columns in each of the quadrants of the circus by putting them nearer the corners of Farringdon Street and New Bridge Street, and substituting the latest type of Keith inverted lamps, similar to those in Fleet Street, but smaller, with a consumption of 10 cubic feet per hour and an illuminating power of 600 candles. By this arrangement the circus was better lighted at a decreased cost.

The number of defective gas-lights observed and reported upon during the year was 2081—viz., 1728 ordinary and 353 high-pressure lamps. The details of the lighting defects in the ordinary incandescent lamps were: Feeble lights, 1280; lights failed, 33—total, 1313. In addition, 415 defects in the lanterns and burners were reported to the Gaslight and Coke Company and rectified. The readings of the gas-meters attached to the public lamps in various parts of the City showed that the full contract quantity of gas was given at these lamps. Mr. Sumner expresses the opinion that this is the case generally, and that the regulators of the lamps are kept in proper condition. In accordance with the instructions in force for many years past, the lamps were lighted whenever fog or unusual darkness occurred. This happened on 35 days during the year, and entailed an additional cost of £236 4s. 9d.

The lighting of most of the main thoroughfares by electric arc lamps was continued throughout the year. The number of lamps of the original "open" type in use on the 31st of December, at a cost of £26 each, was 398. This was a decrease of two, accounted for by the substitution of the new and cheaper flame arc lamp on the new rest in Aldersgate Street, and the abandonment of one lamp on the approach to Blackfriars Bridge—it being no longer required, as the light from the neighbouring high-pressure gas-lamp was sufficient to light this part of the thoroughfare. In addition to this number, there were 34 "Oliver" flame arcs (mostly experimental) and 18 "Reason" enclosed arcs (experimental) in use during the year. These lamps were lighted on 23 days when fog or unusual darkness occurred, at a total additional cost of £146 19s. 2d. The number of defective electric lamps reported in the twelve months was 71, and the City of London Electric Lighting Company were fined for each failure; the amount deducted from their account in fines being £15 18s. 7d. The total number of public electric arc lamps in use on Dec. 31 last was 450; the prices charged being £12 10s., £17 10s., and £26 per lamp per annum, according to the kind of lamp.

Referring to the experimental lighting sanctioned by the Corporation in July, 1907, Mr. Sumner says the Charing Cross and Strand Electricity Supply Company continued last year the lighting of their portion of the area specified—viz., Cannon Street—with eleven magazine flame arcs centrally hung; being suspended over the roadway by wires attached to the buildings on either side at a height of 28 feet. The lamps were started on Nov. 1, 1907. The City of London Electric Lighting Company also continued their experiment with 21 "Oliver" flame arcs for a similar number of the original open arcs—adapting to them existing columns in Holborn, Holborn Viaduct, and part of the Old Bailey, 20 ft. 6 in. above the roadway; while in Farringdon Street, 18 enclosed arcs, of the "Reason" type, fitted up on special short columns 14 feet above the roadway, in lieu of the 12 open arc lamps and columns in that thoroughfare, were maintained during the year. The installation of this area was completed by Nov. 20, 1907, and £17 10s. per lamp per annum is the price paid. The maintenance cost of the "Oliver" flame arcs in the Holborn area is £17 10s. each per annum—equivalent to the charge for similar lamps in Cannon Street. The cost of the enclosed arcs in Farringdon Street is £12 10s. each per annum.

The "Financial News" reports that a seam of good bright coal, 5 ft. 9 in. thick, was pierced near Dover on Friday. The seam is the thickest yet found in the Kent coal area.

SULPHATE OF AMMONIA COMMITTEE.

Report for the Year Ended June 30.

The report of the Executive Committee of the Sulphate of Ammonia Committee for the financial year ended the 30th ult., together with a statement of accounts for this period, has been issued to subscribers. The following are the principal portions of the report.

Money prizes were again offered to agricultural societies and similar associations for various crops grown with sulphate of ammonia, in conjunction with potash and phosphates.

Altogether, 88 societies availed themselves of the Committee's offer of prizes; but fourteen of the competitions arranged were afterwards abandoned owing to insufficient entries and other causes, so that only 74 were ultimately completed—viz., Yellow turnips, 11; swedes, 24; mangels, 30; and potatoes, 9. These competitions are dealt with in the accompanying statement, where it will be found that the winning crops are in almost every case very heavy, and in some instances abnormally so. The experimental plots at the Scottish National Exhibition, 1908, were a conspicuous success, and were dealt with in detail in the "Report on Agricultural Competitions for the Season 1907-8."

Advertising in the chief agricultural papers has been continued during the past manurial season, but on a reduced scale, as it was considered that the money could be employed to greater advantage in other directions. Advertising by means of inset leaflets in the catalogues of Agricultural Societies is being continued, and arrangements have been entered into for the Committee's two-coloured leaflets to appear this year in 74 such publications, giving about 150,000 advertisements. About 570 sets of the Committee's enamelled lettering advertising sulphate of ammonia have now been affixed on the shop windows of agricultural dealers, seedsmen, &c., throughout the country. The decorated sulphate of ammonia tins are still being taken up, although in smaller quantities; and those filled and disposed of to dealers are now sold at a price sufficient to reimburse the Committee for the outlay. Large quantities of pamphlets advocating the use of sulphate of ammonia have been circulated during the recent manurial season by agricultural and horticultural dealers and seedsmen whose names and addresses are printed on the covers. This method of distributing the literature is an economical one, and mutually beneficial to the Committee and to the dealers.

The Committee's show stand has been exhibited at the following Agricultural Shows during the year: Lincolnshire Agricultural Society's Show at Sleaford, July 15 to 17; Tunbridge Wells and South-Eastern Counties Agricultural Society's Show at Tunbridge Wells, July 23 and 24; Leicestershire Agricultural Society's Show at Leicester, July 29 and 30; Yorkshire Agricultural Society's Show at Halifax, Aug. 5 to 7; Bath and West and Southern Counties Show at Exeter, May 29 to 31, 1909; Royal Counties Agricultural Society's Show at Reading, June 8 to 11; Royal Agricultural Society's Show at Gloucester, June 20 to 26. The undermentioned forthcoming shows will also be attended: East Kent Agricultural Society's Show at Sittingbourne, July 7 and 8, 1909; Highland and Agricultural Society of Scotland's Show at Stirling, July 20 to 23; Royal Lancashire Agricultural Society's Show at Southport, July 29 to Aug. 2; Yorkshire Agricultural Society's Show at Beverley, Aug. 10 to 12; Warwickshire Agricultural Society's Show at Stratford-on-Avon, Aug. 25 and 26.

The Committee have arranged for a number of field experiments to be carried out during the current season—two by Agricultural Colleges and eleven by prominent farmers on their own land. It is hoped to very much extend operations in these directions. In the majority of cases, these trials are in series of three, and the crops experimented upon are cabbage, mangels, potatoes, and swedes. The manuring is in accordance with the recipes published in the Committee's pamphlets. The Committee are providing the manures free of charge, and are in some cases contributing towards the cost of labour employed in carrying out the experiments.

The Committee are pleased to report that 23 new subscribers, with an estimated aggregate production of 7500 tons of sulphate of ammonia, have joined during the year. The subscriptions for the period under notice represent a very substantial addition to the total tonnage of members compared with the preceding year; the respective quantities being: July, 1907, to June, 1908, inclusive, 182,797 tons; July, 1908, to June, 1909, inclusive, 202,138 tons—increase, 19,341 tons.

Efforts are being directed with a view to creating more interest in sulphate of ammonia on the part of agricultural merchants in the British Isles; and the Executive would again urge on subscribers the importance of encouraging manure dealers and others to actively push the sales of sulphate. Continental makers specially arrange that local dealers in every town and village are supplied with a price for the season, and always have sulphate of ammonia at command; and everything possible is done by them to increase local consumption. The importance of reserving a sufficient stock of sulphate to meet local requirements during the manurial season is also emphasized.

In consequence of the enormous increase in the production of sulphate of ammonia both at home and abroad, and of the increasing competition of other nitrogenous manures, the Executive have come to the conclusion that every effort should be made to find fresh outlets and new markets for sulphate of ammonia both here and in oversea countries.

At the same time much is being done to attract the attention and sympathy of the British farmer; one way in particular being by getting farmers themselves to carry out experiments for the Committee in such a manner that the advantages to be derived from the judicious use of artificial manures are proved in a manner that cannot be misunderstood. It is hoped to increase very largely the number of these useful demonstrations in the near future; and for this scheme in particular additional funds are urgently required to enable the work to be carried on energetically and on a sufficiently large scale. Demonstrations organized on these lines in Germany have proved eminently successful in augmenting the consumption of sulphate of ammonia in that country; and it is felt that the adoption of similar methods at home, on adequate lines, offers the best prospects of achieving here what Continental makers have accomplished in their own country—viz., a very large

increase in home consumption. The makers who have already expressed their willingness to support foreign propaganda, and for this purpose to increase their subscription to 1s. per ton (if necessary), represent about 175,000 tons; and there is reason to believe a large number of producers still have the matter under consideration.

The question of an oversea propaganda has, for the greater part of the past year, engaged the earnest attention of the Executive Committee, who, in order that the matter might be considered in all its bearings, appointed a Special Committee to thoroughly study the subject. This work has been actively carried on, and it is hoped that before long it will be possible to put some definite results before the subscribers. The inquiry has necessitated a number of special meetings and the preparation and circulation among the members of the Committee of voluminous reports.

Accompanying the report, which is signed by the Chairman of the Committee (Mr. W. G. Blagden), is the following statement, furnishing some interesting results of the agricultural competitions carried out during the past season.

Class I.—*Yellow Turnips.*

All the eleven competitions, for which there were 160 entries, were carried out by Scottish Societies. Taking the first three crops in each competition, there were 14 weighing upward of 40 tons to the acre; the weights of the six heaviest being as follows:—

	Tons.	Cwt.	Qrs.	Lbs.
Stirling Agricultural Society	47	18	3	15
Morayshire Farmers' Club	47	1	1	20
Banffshire (Central) Farmers' Club . .	46	8	1	24
,, ,, ,, ,, . .	46	2	3	12
,, ,, ,, ,, . .	46	0	0	0
Ballingry and Auchterderran Agricultural Society	44	10	0	10

There are in this class some excellent examples of substantial increases in weight due to the addition of sulphate of ammonia to the mixtures of artificials used.

	Tons.	Cwt.	Qrs.	Lbs.
Central Banffshire Farmers' Club—				
With sulphate of ammonia	46	2	3	12
Without sulphate of ammonia . . .	33	12	3	12
Increase due to 1 cwt. of sulphate per acre	12	10	0	0
With sulphate of ammonia	46	0	0	0
Without sulphate of ammonia . . .	35	11	1	24
Increase due to 1 cwt. of sulphate per acre	10	5	2	4
United Banffshire Agricultural Society—				
With sulphate of ammonia	32	2	3	12
Without sulphate of ammonia . . .	20	12	3	12
Increase due to 1 cwt. of sulphate per acre	11	10	0	0

Class II.—*Swedes.*

Of the 24 competitions in this class, for which there were in all 264 entries, 15 were carried out by English Societies, eight by Scottish, and one by an Irish Society. Here again are a number of crops of excellent weight and quality; the six heaviest being—

	Tons.	Cwt.	Qrs.	Lbs.
Banffshire (Central) Farmers' Club . .	46	0	0	0
Staffordshire Agricultural Society . . .	45	11	3	4
Pocklington and District Agricultural Club	43	18	2	8
Staffordshire Agricultural Society . . .	43	13	1	0
Petersfield Autumn Show Society . . .	41	8	2	8
,, ,, ,, . . .	40	11	1	20

There are also in this class some notable instances of large increases in weight obtained from the use of sulphate of ammonia:—

	Tons.	Cwt.	Qrs.	Lbs.
Marnoch and Cornhill Agricultural Society—				
With sulphate of ammonia	33	5	0	0
Without sulphate of ammonia . . .	18	18	2	8
Increase due to 1 cwt. of sulphate per acre	14	6	1	20
Pocklington and District Agricultural Club—				
With sulphate of ammonia	39	12	3	12
Without sulphate of ammonia . . .	28	0	0	0
Increase due to 1 cwt. of sulphate per acre	11	12	3	12
Pocklington and District Agricultural Club—				
With sulphate of ammonia	43	18	2	8
Without sulphate of ammonia . . .	33	14	2	4
Increase due to 1 cwt. of sulphate per acre	10	4	0	4

Class III.—*Mangels.*

In this class there were 30 competitions, comprising 216 entries. Of this number, 29 were carried out by English Societies, and one by a Welsh Society. This class contains many instances of exceptionally heavy crops; there being no less than 20 of upwards of 60 tons per acre the six heaviest being—

	Tons.	Cwt.	Qrs.	Lbs.
Somerset (Mid) Agricultural Society . .	80	15	3	0
Droitwich and Bromsgrove Farmers' Club	79	0	0	0
Staffordshire Agricultural Society . . .	76	7	2	0
Droitwich and Bromsgrove Farmers' Club	75	0	0	0
Staffordshire Agricultural Society . . .	72	7	2	0
Adlington and East Cheshire Agricultural Society	70	0	0	0

The following are a few of the cases where the addition of sulphate of ammonia to the mixtures used had a very marked effect on the weight of the crop:—

	Tons.	Cwt.	Qrs.	Lbs.
Staffordshire Agricultural Society—				
With sulphate of ammonia	72	7	2	0
Without sulphate of ammonia . . .	52	10	0	0
Increase due to 1½ cwt. of sulphate per acre	19	17	2	0
Framlingham Farmers' Club—				
With sulphate of ammonia	48	2	3	12
Without sulphate of ammonia . . .	33	2	3	12
Increase due to 1½ cwt. of sulphate per acre	15	0	0	0
Derbyshire Agricultural and Horticultural Society—				
With sulphate of ammonia	65	14	1	4
Without sulphate of ammonia . . .	52	10	0	0
Increase due to 1½ cwt. of sulphate per acre	13	4	1	4

Class V.—*Late Potatoes.*

In the nine competitions carried out in this class, comprising 75 entries, five were by English, two by Irish, and two by Scottish Societies. The crops were exceedingly heavy; there being only two instances in which they were below 10 tons per acre, while in some cases they were quite abnormal. The six heaviest crops were—

	Tons.	Cwt.	Qrs.	Lbs.
Newry Agricultural Society	21	5	0	0
Cartmel Agricultural Society	19	13	1	0
,, ,, ,, ...	19	8	3	20
Carse and Dundee District Farmers' Club	18	19	1	12
,, ,, ,, ,, ,,	18	6	2	19
Stockton-on-Tees Chamber of Agriculture	17	16	2	8

The following are notable instances of profitable increases in weights due to dressings of sulphate of ammonia—

	Tons.	Cwt.	Qrs.	Lbs.
County Antrim Agricultural Society—				
With sulphate of ammonia	17	2	0	0
Without sulphate of ammonia . . .	10	0	0	0
Increase due to 1 cwt. of sulphate per acre	7	2	0	0
Newry Agricultural Society—				
With sulphate of ammonia	21	5	0	0
Without sulphate of ammonia . . .	17	3	0	0
Increase due to 1 cwt. of sulphate per acre	4	2	0	0
Perthshire Agricultural Society—				
With sulphate of ammonia	16	7	3	2
Without sulphate of ammonia . . .	12	9	0	15
Increase due to 1 cwt. of sulphate per acre	3	18	2	15

STAFFORD GAS AND ELECTRICITY SUPPLY.

The Past Year's Working.

The report of the Gas and Electricity Committee of the Stafford Corporation for the year ended the 31st of March last has lately been issued; and we take from it the following particulars.

The quantity of gas delivered from the works was 203,843,000 cubic feet; being an increase of 6,230,000 cubic feet over that sent out in the year 1907-8. The unaccounted-for gas only amounted to 2,624,725 cubic feet, or 1·29 per cent.—the smallest aggregate loss since 1867, when the make of gas was less than 32 millions. The sale of gas yielded £25,611, after deducting the cost of the service to the public lamps; being an increase of £788. The past year was weaker than its predecessor in all classes of residual products; tar and sulphate of ammonia showing heavy drops, and coke sales also a decrease. They yielded £7365; being a fall of £558. Coals cost £9156, or an increase of £221; the average price being rather more than 2d. per ton above last year's rate. Manufacture cost £4788, compared with £4568; distribution expenses amounted to £2382, against £2182; and management charges to £571, compared with £556. Rates and taxes were £1125—the previous year's figure being £1107; and miscellaneous small items cost £97, as compared with £104. Stove repairs, less the hire of gas-stoves, cost more than the profit made on gas-fittings by £102.

The total revenue was £33,563, and the total expenditure £18,809; the gross profit being £14,754—a decrease of £1171. After deducting the charges against the net revenue account, amounting to £9290, and adding the balance of £196 brought forward from the previous accounts, there was at the end of the year an available balance of £5660—a decrease of £236. The Committee recommend that a sum of £3000 be transferred to the district fund, and that £50 be granted to the Free Library Committee; that £1000 be transferred to the credit of the suspense account relating to the carburetted water-gas plant; that £1000 be added to the reserve fund; and that, after payment of the usual bonus, the balance be carried forward.

The expenditure on capital account has been marked down to £113,155, in accordance with the Committee's resolution last year. The total loans repaid amount to £71,222, and there is now owing a sum of £42,661 under this heading. With the contribution this year, the total sum paid out of profits in aid of the rates will amount to £51,675. The total capital expenditure in connection with the Electricity Department now stands at £32,500; the loan repaid amounts to £11,144; and there is still owing under this heading a sum of £21,355. The quantity of electricity sold last year for private lighting was 159,549 units, and for power purposes 212,139 units; while public lamps accounted for 8665 units. The total units sold amounted to 380,353, compared with 361,622 units last year. The equivalent of 2304 8-candle lamps was connected to the main cables during the year; making the total equivalent 24,603 lamps, compared with 22,299 lamps last year.

The revenue from all sources was £4467, and the expenditure £2002. he gross profit was therefore £2465, compared with £2587 for the preous year. The charges against the net revenue account were £2108. nless some unforeseen expenditure is necessitated, the Committee ope that the contributions from the rates received during the year ill be the last they will have to ask for.

Appended to the report are analyses of the accounts of the two deartments by the Engineer and Manager (Mr. Hubert Pooley, Assoc. [.Inst.C.E.). The quantity of coal carbonized and the coal equivalent f oil and coke used in the manufacture of carburetted water gas was 7,863 tons; and the make of gas was 203,850,000 cubic feet, or at the ate of 11,412 cubic feet per ton. The residuals sold per ton were: oke, 9·45 cwt.; tar, 11·2 gallons; sulphate of ammonia, 23·2 lbs. he net proceeds of the residuals were 80·4 per cent. on the cost of oal, &c. The total working expenses came to 10s. 0·436d. per ton f coal carbonized, and to 10·829d. per 1000 cubic feet of gas sold; e net profit being 6s. 1·42d. and 6·602d. respectively. Adding the alance carried forward, these figures are brought up to 6s. 4·056d. and 839d. The total working expenses in the Electricity Department ame to £2002, or at the rate of 1·263d. per unit sold. The gross profit as £2465; but it was subject to the interest on the capital, the repayent of loans, income-tax, and the bonus to workmen, amounting gether to £2109—leaving £356. Adding the contribution from the istrict fund, £4650, there was produced £5006, which was disposed f as follows: Depreciation fund, £1000; suspense account, £1793; eserve fund, £1143; provision for discounts and allowances, £400; ritten off fixed plant account, £563—total, £4900, leaving a sum of 106. Adding the balance carried forward, this figure is brought up to 110. The proportion of the total working expenses to the gross profit 44·81 per cent.; the total revenue per kilowatt capacity of the plant is 7 18s. 1d.; the working expenses ditto, £3 10s. 10d.; and the revenue er 8-candle lamp connected, 3s. 7d. The price charged for lighting is l. per unit and no meter-rents, with discounts up to 15 per cent.; the harge for power is 1½d. to 2½d. per unit, according to quantity.

EXPLOSION AT THE HANLEY GAS-WORKS.

Eight Workmen Injured.

A serious accident, by which eight men were badly burned, occurred n Monday last week at the Hanley station of the British Gaslight Company, Limited. It appears that about half-past seven in the orning a number of men were engaged emptying a purifier, when, ithout any warning, a sheet of flame enveloped them. Members of e works ambulance corps rendered first aid to the injured men, and edical assistance was summoned. Five of the sufferers, who were urnt about the head and shoulders, were afterwards removed—three o the North Stafford Infirmary and two to the Workhouse Infirmary, s there was not sufficient room at the former institution, two of the ards being closed for painting. The other three men were taken to heir homes. This is the first accident of the kind which has happened t either the new or the old works of the Company. As to the cause, t is thought probable that it was due to air coming in contact with the as left in the purifier after the covers had been removed, and the esulting explosive mixture being ignited by a spark from the pick of a orkman. There was only one flash, and no damage was done to the urifier or to the surrounding buildings.

In the House of Commons last Thursday, Mr. W. Thorne asked the President of the Board of Trade whether his attention had been called o the serious explosion in a purifying-box that took place at the Hanley Gas-Works on the previous Monday; if so, whether he could state what was the last time the box was emptied, and how long the lid had een lifted before the men were ordered into the box to work; and whether the Board of Trade were prepared to thoroughly investigate he matter. The Home Secretary (Mr. Gladstone), who replied to the uestion, said he was making inquiry into the accident, and would nform the honourable member of the result.

Bland Light Syndicate.

The first annual meeting of the Bland Light Syndicate was held on the 15th inst.—the Managing-Director (Mr. C. W. Bland) in the chair. The Directors, in their report, considered that the accounts for the year ended April 30 showed figures of a highly satisfactory nature. An interim dividend at the rate of 10 per cent. per annum for the six months ended Oct. 31, 1908, was duly paid, and the Directors now recommended a further distribution at the same rate—making 10 per cent. for the year. This distribution still enabled the Directors to carry forward a satisfactory amount to next year. The business of the Company, since its inception, it was pointed out, "has shown continuous expansion, and the returns for this year to the date of the report show a further considerable improvement over the corresponding period of last year."

Gas v. Electricity for Workhouses.—The Uxbridge Board of Guardians at their last meeting considered certain matters relating to the lighting of the Workhouse. The Chairman (Mr. Stilwel) said the Medical Officer had reported in favour of electric lighting; but he (the speaker) was of opinion that gas was the cheaper illuminant, though electricity would be the better one both as regarded the purity of the atmosphere and the cost of keeping the establishment clean. Mr. De Salis said the Electric Light Company charged 5d. per unit, and he suggested that the Guardians could generate electricity at a very much cheaper rate. He moved—"That, subject to the cost being hereafter approved, it is desirable that a system of electric lighting should be installed, the light to be generated by plant owned by the Guardians." Mr. Bailey pointed out that gas was supplied to the Workhouse at 3s. 3d. per 1000 cubic feet, which, considering that the price in London was 3s., was very fair. The Gas Company had even promised them a reduction on the 3s. 3d. The motion was rejected, and a Committee was appointed to go into the whole question and report to the Board.

NEW WATER-WORKS FOR MANSFIELD.

On the invitation of the Mayor of Mansfield (Alderman T. Taylor) and the Chairman of the Water Committee (Alderman J. E. Alcock), a numerous company, representative of the Town Council and of other local authorities, assembled at Clipstone, near Mansfield, on Wednesday last, to participate in the opening ceremony and inauguration of the new water-works recently constructed by the Corporation for the supply of the borough and the adjoining districts served by them under agreements. Up to now Mansfield has been supplied from the Rainworth pumping-station, which was erected about thirteen years ago; but the growth of the town, in consequence of the development of collieries in the district, has been so rapid that a further supply from another watershed became imperative, and an Act was obtained by the Corporation in 1905 and a well sunk in the new red sandstone at Clipstone about five miles north-east of Mansfield. The new works are designed for a similar duty to those at Rainworth—viz., 750,000 gallons per day—which the latter works have proved themselves well able to fulfil. The contract for the well specified that it should be sunk to the depth of 150 feet, and headings driven from the bottom; but water was obtained so freely that it was unnecessary to carry the well to the full depth, or drive the whole of the headings provided, before the test quantity of 1,680,000 gallons per day was continuously pumped. Borings were also put down to further increase the yield, so that the designed quantity may be maintained after many years of continual pumping. When the well had been proved to the satisfaction of the Corporation's Consulting Engineer, Mr. F. Walter Hodson, M.Inst.C.E., F.G.S., the erection of the permanent works proceeded.

The pumping-station is a compact and substantially built block placed immediately over the well, comprising an engine-house, 38 feet by 28 feet, a boiler-house, coal-store, fitting-shop, and store. The fitting-shop communicates with the engine-room, and is provided with lathe, drill, and other tools for maintaining the machinery in first-class condition, and effecting all ordinary repairs. The engine driving the tools also drives a dynamo for the electric lighting of the station. Two cottages have been erected on the site, for the accommodation of the engine drivers. The pumping main is 15 inches diameter and five miles long, and is connected to the existing gravitation main from the reservoir, so that water is pumped direct from Clipstone to the town; any excess over the consumption for the time being passing direct into the reservoir. The pumping machinery consists of two duplicate sets of compound surface-condensing steam-engines, each driving through gearing a set of treble-barrel deep-well pumps of the stand-pipe type. Each set is capable of pumping 40,000 gallons of water per hour a total height of 468 feet to the reservoir. The steam cylinders are 12 inches and 21 inches diameter, with a stroke of 24 inches; the steam pressure being 125 lbs. per square inch. A pair of steel Lancashire boilers are installed, and a 4-ton overhead traveller fixed in the engine-house. The pumping-station is connected by telephone with the offices at Mansfield, and also with the Rainworth works. An apparatus is provided for showing a continual record of the water level in the reservoir and also in the well; and a "Venturi" meter is fixed to check the pumping and assist in the prevention of waste. The total cost of the works, including land, will be less than £30,000.

The Mayor heartily welcomed the assembled company. He said he was sure Mansfield was to be congratulated upon the beautiful works they were opening, which looked like answering their requirements for many years to come. The town owed its very best thanks to the Duke of Portland for providing it with a valuable site upon which to erect the pumping-station. The price paid for the 5 acres of land was only £550; and when this was compared with the cost of the Nottingham and Lincoln undertakings, he thought the one at Mansfield had been provided very economically indeed.

Alderman Alcock then gave some interesting facts concerning the two water-works of the Corporation. At present, the Rainworth works, though designed for a population of 30,000 people, were supplying 54,000; and though the two sets of works were designed to serve 60,000 people, they would, if the present rate of population continued, be fully occupied in pumping to meet the public needs. It was in 1903 that the late Alderman Barringer and his Committee saw the advisability of seeking a fresh site. Since then, the population supplied from the Rainworth undertaking had increased from 37,000 to 54,000—an increase of 40 per cent.; and he could easily imagine that if the population increased in the same proportion during the next few years, they would soon have to enlarge at Clipstone or seek another site. They felt grateful that they had such an excellent supply of water close to the town; and he joined with the Mayor in expressing thanks to the Duke of Portland for the handsome way in which he acceded to the Council's request for a site. With regard to the quality of the water, it was excellent. Not only was this the case, but they had a water undertaking which was a great financial benefit to the town, as was evidenced by the fact that up to the present time the Rainworth works had contributed no less than £20,000 to the relief of the rates—last year's contribution alone being equal to a 5d. rate. In the Clipstone, as in the Rainworth undertaking, the Council had been ably advised by Messrs. Hodson, of Loughborough, the Council's Consulting Engineers.

Mr. Hodson also gave some interesting details respecting the new supplementary supply, and said he could only wish the present undertaking would be as great a success as was the one at Rainworth. The cost was much lower than the average of such undertakings.

The Mayor then proceeded to unlock the door of the pumping-house with a handsome silver key presented to him by Mr. Hodson; and the company having assembled in the room, he started the engine named "Taylor," after himself, while Alderman Alcock started the other engine named "Alcock." After an inspection of the premises, the party adjourned to a marquee, where they partook of refreshments provided by the Mayor and Alderman Alcock, to both of whom a hearty vote of thanks was accorded.

The Blandford Gas Company, Limited, has lately been registered with a capital of £20,000, in £1 shares (7500 preference), for the purpose indicated in the title.

NOTES FROM SCOTLAND.

From Our Own Correspondent. *Saturday.*

The Edinburgh and Leith Gas Commissioners held their monthly meeting on Monday last. The Commissioners, without remark, approved the annual accounts, which were published in the "JOURNAL" on June 29, and which had since been certified by the Auditor. They also resolved, on the motion of Bailie Bryson, the Convener of the Works Committee, to carry forward to the current year the balance of £2619 brought out. To these accounts there has been added, at the request, or perhaps upon the order, of the Secretary for Scotland, a sheet showing an abstract of receipts and expenditure from the date of the constitution of the Commission in 1888 to May 15 of this year. The Commissioners have been in the habit of issuing separately a sheet giving statistics regarding the working of the undertaking—the output and sale of gas, the costs, wages, &c.; and the sheet now issued will, taken along with the other, enable the position of the Commissioners to be ascertained at a glance. In the sheet appended to the accounts, it is stated that the receipts upon capital account for the past year amounted to £27,035; the expenditure to £5687; the total expenditure on works to £1,621,872; the annuities (nominal value) to £341,893; the loans to £1,210,410; the annuities redeemed out of sinking fund to £28,107; and the loans redeemed out of sinking fund to £79,873. In the revenue and profit and loss account, the entries are: Gross revenue, £347,502; management and maintenance, £233,881; pensions or other allowances, £1473; annuities, £32,555; interest, £41,573; sinking funds, £23,904; reserve fund, £5594; surplus, £8520; and price of gas, 3s. The Commissioners approved of a first list of pensioners under their Provisional Order of last year, and instructed that the Engineer should decide as to the workmen to be from time to time superannuated, and that he should report his decisions. The list includes twenty-four names of workmen ranging from 60 to 80 years of age, and having from ten to 56 years' service. The pensions range from 7s. 2d. to £1 1s. 9½d. per week. The total of the allowances is £14 17s. 4½d., and the average payment 12s. 4d. per week.

In the Alloa Corporation Gas-Works last year, the make of gas, corrected to 60° Fahr. and 30 inches barometer, amounted to 120,978,500 cubic feet—an increase of 2,648,200 cubic feet; and the sale showed an increase of 3 737,400 cubic feet. The percentage of unaccouted-for gas was 3·05, as compared with 4·88 the previous year. The revenue was £16,653—£12,794 from the sale of gas, £2186 from coke, £437 from tar, and £1117 from sulphate of ammonia. The total revenue was £2019 less than in the previous year. The total expenditure was £16,223, of which £6667 was for coal, £87 for benzol, £46 for purification, £385 for meters, £1842 for wages, £460 for salaries, £466 for cooking-stoves, £856 for repairs and furnishings, £1175 for interest on loans, and £1993 contribution to the sinking fund. The balance of profit was £429. The gross cost per 1000 cubic feet of gas was 2s. 1·89d. per 1000 cubic feet, and, less 7·40d. for residuals, the net cost was 1s. 6·49d., compared with 1s. 9·61d. in the previous year. The quantity of coal carbonized was 12,875 tons—a decrease of 115 tons. The average price was 10s. 2½d. per ton—a decrease of 2s. 7½d. The yield of gas per ton was 9396 cubic feet—an increase of 294 cubic feet. The revenue from gas was £1360 less, and from residual products £768 less. The day consumption—from 6 a.m. to 6 p.m.—was equal to 50·43 per cent. of the total. The number of consumers at the close of the year was 4161—an increase of 56. There were 2426 consumers with ordinary meters—a decrease of 20—and 1941 with automatic meters, or an increase of 76. There were 3064 stoves, &c., in use—an increase of 498. Of gas-engines, there were 67 in use—an increase of one. The accounts have not yet been adopted by the Town Council.

In the Kilmarnock Town Council last week, Treasurer James Smith said that the revenue of the Gas Department for the year amounted to £25,268, against £27,558 in the previous year; and the expenditure to £22,390, against £24,431. At the beginning of the year there was a balance on hand of £4527, which had now been reduced by the year's operations to £3635; showing a loss of £892 on the year. The Gas Committee, they would remember, had thought that the price of gas should be increased; but, out of deference to the wishes of the Council, the old figure was retained. The Gas Committee reported that the meter account had gone up during the year to about £2000, against £800 in the previous year, due to the increased popularity of prepayment meters; and the Committee suggested that a proportion of the amount should be charged to capital. Provost Gemmill said that the principal reason for the deficit in the gas revenue was that in September, 1908, they reduced the price of gas from 2s. 8½d. to 2s. 6d. per 1000 cubic feet.

The annual meeting of the shareholders of the Montrose Gaslight Company was held on Wednesday—Mr. A. Muirden presiding. The Manager—Mr. A. Mackay—submitted his annual report, which showed that the quantity of gas manufactured during last year was 32,393,500 cubic feet—an increase of 125,000 cubic feet over the previous year. During the year, 443 meters were fixed, of which 130 were for new consumers. The number of boiling-rings, grills, cookers, gas-fires, &c., amounted to 130. The leakage had been considerably reduced. The balance-sheet showed a profit, after allowance for depreciations, of £1147. It was unanimously agreed that a dividend of 45s. per share be paid—an increase of 2s. 6d. per share upon the dividend paid a year ago. The Chairman stated that, so far as he could see, the new Board of Directors would be able to make a reduction in the price of gas for the current year.

The Carnoustie Town Council on Monday unanimously, on the motion of ex-Provost Soutar, adopted the Burghs Gas Supply (Scotland) Act. The Clerk read a letter from the Directors of the Gas Company, in which it was stated that they were prepared to recommend the shareholders of the Company to sell their undertaking to the Council at the price of £21,000. As stated in these "Notes" last week, the representatives of the Town Council at the recent conference agreed that they would offer £19,000. Ex-Provost Soutar said he had every confidence that an amicable settlement would be come to. Bailie Rae pointed out that the difference of £6000 which had existed had now been reduced to £2000.

The following appears in the "Southern Reporter" of this week: "Mr. Russell, Edinburgh, who formerly occupied the position in Selkirk of Dean of Guild, presided at the annual meeting of the shareholders of the Selkirk Gaslight Company—Mr. George Roberts, Dandswall, Chairman of Directors, being unable to be present. After the adoption of the annual report and financial statement of the Company, the recommendation of the Directors that no change be made in the price of gas was submitted and unanimously approved. A recommendation with reference to the allocation of the year's profits was also considered. The profits for the year amounted to £1416, and it was proposed that the allocation be as follows: Interest or dividend at 10 per cent. on original share capital, £453 10s.; bonus thereon at 2½ per cent., £113 7s.; depreciation account, £250; sum carried to surplus account, £599 13s. 9d. An important recommendation from the Directors that the capital of the Company should be increased to £20,000 (£18,140 issued) was submitted, and unanimously passed."

Part of a scheme of contemplated improvements and extensions at the works of the Selkirk Gas Company has been completed. The yard of the works has been covered over by a corrugated iron roof, resting upon iron columns and beams, at a cost of nearly £800. A duplicate set of engines and exhausters has been erected, to take the place of a single set. These are capable of passing from 15,000 to 20,000 cubic feet of gas per hour. The Contractors were Messrs. George Waller and Son, of Stroud. Before the winter season, it is in contemplation to put in new retorts, at a cost of about £800. Further improvements contemplated are the erection of a tar-extractor, at a cost of about £200; and an extension of the gasholders, at a cost of from £1800 to £2000.

The annual meeting of the Berwick and Tweedmouth Gaslight Company, Limited, was held on Wednesday—the Chairman, Mr. G. S. Riddle, presiding. There was a net profit of £1110 reported for the year. The consumption of gas was a record one, which was attributed to the increased use of gas-cookers. A dividend of 10 per cent., free of income-tax, was declared; and it was decided to reduce the price of gas from 3s. 11d. to 3s. 10d. per 1000 cubic feet.

The Thornhill New Gas Company have paid a dividend of 5 per cent., free of income-tax; the Ferryport-on-Craig (Tayport) Gaslight Company, Limited, one of 5 per cent., free of income-tax; the Stow Gaslight Company, Limited, one of 3 per cent., free of income-tax; and the Duns Gas Company one of 8s. a share, equal to 6·4 per cent., with a bonus of 5s. per share.

At the meeting last week of the Town Council of Newmilns, Ayrshire, the Treasurer reported that last year's working of the Corporation gas-works had resulted in a loss of £201. The Committee considered the loss, but decided not to interfere with the price of gas at present.

An action has been before Sheriff-Substitute Macaulay Smith in the Small Debt Court at Duns, in which Mr. Jas. Herriot, the Treasurer of the Duns Gas Company, on behalf of the Company, sued Mr. Andrew Tindal, house painter, Duns, for an order to deliver a prepayment meter which is situated in the workshop of the defender. It was pleaded in defence that the pursuer had no title to sue; also that the meter was the property of the defender, having been part of the subjects which he purchased from the previous occupier at Whitsunday last. A receipt was produced which, it was submitted, covered the purchase of the meter. It was also contended that in Duns the custom was that in all sales the gas-meters went along with the property. As a matter of fact, the defender had, under this sale, already received one meter; and the sale certainly covered the other. The Sheriff-Substitute decided that it was competent for the Company to delegate power to sue and be sued; and, further, that the meter was the property of the Gas Company. He therefore gave decree.

A Proposed Reduction at Halifax.—The Halifax Gas Committee met last Wednesday, when it was stated that the coal contracts for the year ending June next had been completed at substantially lower prices than those of last year. The Committee decided to recommend the Town Council to reduce the price of gas for lighting purposes within the borough. The rates proposed vary from 2s. to 1s. 10d. per 1000 cubic feet net, according to consumption; the present net price being 2s. 1d. Outside the borough, the revised prices will vary from 2s. 7d. to 2s. 5d. per 1000 cubic feet net. For power purposes within the borough the new scale runs from 1s. 9d. to 1s. 7d. per 1000 cubic feet net, according to consumption.

Charge for Gas and Meter-Rents at Sudbury.—As already announced in the "JOURNAL," the Directors of the Sudbury Gas Company, Limited, have reduced the price of gas 5d. per 1000 cubic feet (from 4s. 7d. to 4s. 2d.) for lighting purposes, and 3d. per 1000 cubic feet if used for cooking and motive power, making it 3s. 9d. In the circular notifying the reduction, they said they intended in future charging meter-rents. As this has not been done since the works were opened sixty years ago, the consumers are protesting against it; and at a recent special meeting of the Traders' Association, a deputation was appointed to wait upon the Directors on the subject. It was also decided that a petition should be prepared for signature by consumers and presentation by the deputation.

Launceston Public Lighting.—For the coming year, the Launceston Gas Company's tender for the public lighting was the same as that for the past twelve months. A Committee of the Launceston Town Council recommended the acceptance of these terms, expressing the hope that the Company would allow an abatement of 1s. per lamp. The Mayor (Mr. J. Killow) said the Committee came to their decision very unwillingly, but they saw no other course. They felt strongly that they were paying in Launceston more than was being paid in any other town in Cornwall, or in similar sized towns in Devon. Mr. Treleaven, a Director of the Company, contended that they had shown the Council and the town consideration in many ways. Mr. Treleaven, jun., another Director, said if the Council were not satisfied with the inquiries they had made, the Company would be willing to give them further time before signing the contract. It was not fair that it should go out that the Company charged more than was done in any other towns, unless they had absolute facts in support of the assertion. It was eventually decided to seal the contract, and at an early date to go into the whole question of the cost of the public lighting of the town.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 24.

Sulphate of Ammonia.

There has been rather more demand as the week has progressed, occasioned by requirements for covering July contracts; and at the close a slight improvement in values has resulted. The closing quotations are £11 2s. 6d. per ton f.o.b. Hull, £11 3s. 9d. per ton f.o.b. Liverpool, and £11 5s. to £11 6s. 3d. per ton f.o.b. Leith. Buyers continue to inquire for delivery ahead; but no important business has transpired.

Nitrate of Soda.

The market for this remains quiet, but no further decline has taken place; to-day's quotations being 9s. 9d. per cwt. for 95 per cent. and 10s. for refined quality, less 2½ per cent. discount.

LONDON, *July* 26.

Tar Products.

There is practically nothing fresh to report in the markets for tar products during the past week. Pitch is still very firm; and buyers are more inclined to negotiate at present prices. Creosote is also firm, both in the North and in London. In some cases it is thought that there will be a coal strike in Scotland, which will result in a decrease in the output of the B.F. product, and so increase the demand for English oil.

The average values during the week were: Tar, 15s. 6d. to 20s. 6d., Pitch, London, 28s. to 29s.; east coast, 28s. to 28s. 6d.; west coast, 27s. 6d. to 28s. 6d. f.a.s. Mersey ports, 27s. 6d. to 28s. f.o.b. other ports. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 6d. to 6¼d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6¾d. to 7d. Toluol, casks included, London, 8¼d. to 8½d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3¼d.; solvent naphtha, casks included, London, 10¾d. to 11¼d.; North, 9½d. to 10d.; heavy naphtha, casks included, London, 10½d. to 10¾d.; North, 9½d. to 9¾d. Creosote, in bulk, London, 2¾d. to $2\frac{13}{16}$d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2⅞d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 11d. to 11¼d.; west coast, 11d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is quiet, and in many quarters considered to be weaker. Beckton prompt is £11 7s. 6d., and for ordinary London makes, upon Beckton terms, £10 18s. 9d. to £11. In Hull, £11 is asked; in Liverpool, £11 2s. 6d.; while in Leith, £11 5s. to £11 6s. 3d. is quoted.

COAL TRADE REPORTS.

Northern Coal Trade.

The northern coal trade has been influenced in the last week by the uncertainty prevailing as to labour disputes in other districts, and prices have therefore been largely nominal. In steam coals, best Northumbrians are quoted at from 12s. 9d. to 13s. per ton f.o.b., second-class steams were 11s., and steam smalls from about 5s. 3d. to 6s. 3d. These prices, however, are affected by the prospect of the settlement in Scotland, and for some days they are likely to be rather irregular, though the current demand is good. In the gas coal trade the inquiry is full, and best sorts are very brisk for this season of the year. Durham gas coals vary in price from about 10s. to 11s. per ton f.o.b. for the usual classes, according to quality, and for "Wear specials" up to 11s. 6d. is quoted. The local demand for gas coals now shows some signs of increase, and with heavy exports the output appears to be well taken up. There have been one or two forward sales for export over the shipping season; and, after allowing for freight, it is believed that there will remain something like 10s. 9d. per ton f.o.b. for best gas coals. Other contracts are in negotiation. Coke seems rather quiet, but with a limited production gas coke is steady at from 12s. 9d. to 13s. per ton, f.o.b. in the Tyne.

Scotch Coal Trade.

Last week being holiday week among the miners of Scotland, there was no official report as to trade or prices. The labour question is dealt with elsewhere. The statistics as to shipping showed the quantity last week as 366,727 tons—an increase of 16,249 tons upon the preceding week, and of 46,181 tons on the corresponding week. For the year to date, the total shipments have been 8,080,598 tons—an increase upon the corresponding period of 581,220 tons.

It will be seen, from an announcement which appears elsewhere, that the Cincinatti Gas Transportation Company are offering, through the London and County Banking Company, Limited, $3,000,000 of guaranteed first mortgage 25-year 5 per cent. gold bonds at the price of $975 (being 97½ per cent.) per $1000 bond, which at the exchange of $4·86⅔ would equal £200 7s. The bonds constitute a first mortgage upon all the property of the Company, present and future, and they may be redeemed after July 1, 1913, at the price of 110 per cent. and accrued interest; payment of the principal being guaranteed by the Cincinnati Gas and Electric Company and by the Columbia Gas and Electric Company. The Company was incorporated last year for the purpose of constructing and equipping a pipe-line for the conveyance of not less than 60 million cubic feet of gas per day from the natural-gas fields belonging to the second of the above-named Companies to the pipes and mains of the first in the city of Cincinnati. The pipe line has been completed, and the gas is being delivered. The list of subscriptions opened yesterday, and will close to-morrow.

Local Government Provisional Orders Bills.

The Local Government Provisional Orders (No. 5) Bill came before the Unopposed Bills Committee of the House of Lords last Tuesday. It confirms, among others, a Provisional Order for altering the Kendal Gas and Water Act, 1894, to provide for an extension of the limits of supply so as to include parts of the townships of Strickland, Kettle, and Strickland Roger. Formal evidence having been given in proof of the preamble, the Bill was reported for third reading. The same day, another Bill of the Local Government Board (No. 8) came before the Committee. It contained an Order repealing the Coventry Gas Acts, 1856 and 1859, so as to protect the Corporation fittings lent out on hire from distress, and enable the Corporation to specify the size of the pipes and materials to be used. The preamble was proved, and the Bill ordered for third reading.

Collection of Municipal Revenues at Salford.

The Salford Town Council at last Wednesday's meeting approved of a scheme for the consolidation and collection of the municipal rates, gas and electricity accounts, and water-rents. Instead of there being a separate collector for each department, there will in future only be one calling on the ratepayer for these accounts. There are in Salford itself 9192 gas and electricity accounts, 6035 water accounts, and 6015 rate accounts. Under the new scheme, these will be given to four collectors in equal proportions. Each gas collector has at present 6000 accounts to look after. There are in the Pendleton and Broughton districts 16,723 gas and electricity accounts and 7807 rate accounts. These will be divided among four collectors, each having 6150. In the out-districts there are 13,822 gas and electricity accounts; and it is proposed to divide these between two collectors. It is claimed that by the new scheme considerable economy will be effected both in labour and expense. All the collections under the re-arrangement will be controlled by the Finance Committee.

Registration of Plumbers.—At the sitting of the Engineering Section of the Health Congress at Leeds last Wednesday, Mr. Searles-Wood proposed the following resolution: "That it is necessary to the effective administration of the Public Health and Water Acts that the respective authorities be recommended and empowered to require that the competency of plumbers employed to execute or inspect plumbers' work under the regulations of these authorities shall be certified by the Plumbers Company, under the conditions appertaining to the national registration of plumbers; or by such other body as may be set up by Statute or be appointed by the Local Government Board." Mr. E. F. Hall, F.R.I.B.A., seconded the motion. In answer to a question, Mr. Searles-Wood said the movement was to register both the master and the man. The resolution was carried.

Borrowing Money without Sanction.

In the Chancery Division of the High Court of Justice last Tuesday, Mr. Justice Swinfen Eady had before him an action brought against the Tottenham Urban District Council by the Attorney-General, on the relation of a ratepayer, for a declaration that an overdraft of £4910 by the Council at their bankers and the payment of £855 and £900 for interest on overdrafts were illegal and *ultra vires*. The Local Government Board had in 1903 and 1906 sanctioned the borrowing of a large sum of money towards erecting and furnishing municipal offices, a central fire station, and public baths at Tottenham at a cost of £58,990, about half this sum being met by the proceeds of the sale of the water undertaking to the Metropolitan Water Board. In 1907, the Council applied for leave to borrow £18,350 more for extra expenses which they had incurred. Thereupon an inquiry was ordered, with the result that the Local Government Board wrote complaining that the original plans and estimates had been departed from, and, instead of the plain and simple building contemplated, one of expensive design and workmanship had been erected; and they refused their sanction in respect of £4910. The Council, however, paid the whole of the expenses incurred by overdrawing on their bankers; and they had also paid £855 in interest—the other sum of £900 being an estimate. They proposed to pay and discharge the £4910 out of the general district rate. Mr. Macmorran, K.C., and Mr. J. Scholefield appeared for the relator; Mr. Danckwerts, K.C., Mr. Frank Russell, K.C., and Mr. Herbert Nield represented the defendants. His Lordship made a declaration to the effect that the Council were not entitled to make any payment of interest on money borrowed, by way of overdraft or otherwise, without the sanction of the Local Government Board; that the payment of the £855 was illegal, and ought to be disallowed; and that the overdraft of £4910 made without such sanction was illegal. He restrained the defendants from making any further payment of interest on money borrowed without such sanction, whether by overdraft or otherwise, and from applying any part of the general district fund or rate, or other public fund or rate under their control, in repayment of the loan of £4910 or any part of it. But the injunction was not to operate to prevent the payment of interest by the Council under any statutory authority enabling them to make the payment.

Last Friday, the officials and employees at the Stockton Corporation Gas-Works, to the number of 160, had their nineteenth annual excursion; the place visited being Carlton-in-Cleveland. The Mayor (Alderman Bambridge) and several members of the Corporation accompanied the party. A complimentary dinner was given, at the Blackwell Ox, by Mr. William Ford, to commemorate his service of upwards of forty years as Manager of the gas-works. Mr. Ford was heartily congratulated, and thanked for providing the dinner. Before and after dinner various sports were indulged in; and at five o'clock the prizes were presented.

North Cheshire Water Supply.—The Hale District Council have appointed representatives to attend a conference of local authorities whose districts are served by the North Cheshire Water Company, which has been convened by the Bucklow District Council for the purpose of considering the advisability of acquiring the Company's powers.

Reduced Charge for Public Lighting in the City.—Consequent upon a reduction of 1d. per 1000 cubic feet (viz., from 2s. 5d. to 2s. 4d.) in the price of gas by the Gaslight and Coke Company from Midsummer, the inclusive annual charge for the high-pressure inverted gas-lamps in Fleet Street will be lowered from £16 10s. to £16 0s. 10d. each; and all other gas-lamps in the City in proportion.

Public Lighting of Tewkesbury.—The chief business before the Tewkesbury Town Council at their meeting last week had reference to the public lighting contract. The Gas Company asked for a five years' renewal of the contract; and the majority of the Council present at the previous meeting who were qualified to vote decided that the contract should lapse, unless the Company were willing to enter on a twelve months' agreement. Correspondence passed between the Council and the Company; and the latter finally offered to continue the lighting on the arrangement that no notice for determination of the contract should be given till after the first year. The General Purposes Committee recommended acceptance of this condition; and the Council agreed.

East Surrey Water Company, Limited.—At the annual general meeting of the Company, the Directors reported a profit of £27,328. Adding the balance brought forward (£3405), there was produced a total of £30,733. Allowing for interim dividends, &c., already paid, and placing £2000 to the credit of the renewal and contingency fund, there remained £13,074. The payment of the final dividends (at the rates of 10 and 7 per cent. on the "A" and "B" stocks) would absorb £9423, and leave £3651 to be carried forward. The report was adopted. The Chairman (Mr. P. Riddoch), in acknowledging a vote of thanks to the Directors, proposed a similar vote to the staff. He said that the Directors were specially pleased with the construction work that had been going on, which reflected great credit upon their Engineer and Manager (Mr. A. E. Cornewall-Walker, Assoc.M.Inst.C.E.). Those of the staff who were in charge of pumping-stations were also deserving of thanks. The motion having been carried, Mr. Cornewall-Walker (who is also Secretary of the Company) briefly acknowledged the vote. He said he had the greatest pleasure in working with all the staff; and he thought this feeling was mutual.

Lymington Water Supply.—A special meeting of the Lymington Town Council was held on Monday last week to consider the report of Mr. W. Matthews, M.Inst.C.E., as to the installation of permanent pumping plant in connection with the Ampress (artesian well) water supply. The Committee who had had the matter in hand reported that they had considered Mr. Matthews' report, advocating sinking a well, 50 feet deep, and putting in deep-well pumps, driven by suction-gas engines and plant. He estimated that the cost for power alone would be as follows: Suction gas, £50 for nine hours per day and £61 for eleven hours; oil fuel, £145 and £178; electric current, £205 and £250. The total cost of the works recommended was: Well shaft, £450; sand-collecting tank, £120; duplicate well-pumps, £400; duplicate gas-engines and gas-producers, £450; alteration of gearing and pump-drives, £50; buildings, £150—total, £1620. The Committee were of opinion that instead of adopting Mr. Matthews's recommendation in regard to the sinking of a well and putting in deep-well pumps, it would be best to adopt an air-lift pumping plant, to be worked by suction-gas engines; and they recommended accordingly. They said the capital cost of £1620 referred to above, would be considerably reduced if this recommendation should be acquiesced in. The report was adopted.

A Settlement of the Castle Donington Lighting Question.—At a special meeting of the Castle Donington Rural District Council, held for the purpose of considering the terms proposed by the Draycott Gas Company for the public lighting of the town, the Chairman (Mr. L. Stevenson) said the Committee of the Council had met the officials of the Company, and the latter had submitted proposals which were quite fair and equitable. There were some slight differences on points of detail; but speaking generally the Committee recommended the Council to agree to them. The public lamps would be lighted from Sept. 1 to April 30, at a charge of £1 6s. 8d. per lamp. Four nights in each month near the full moon would be exempt. It was also necessary, if satisfactory results were to be obtained, that nearly the whole of the existing lanterns should be replaced by others of a more modern type. The cost of this could be spread over a period which would obviate any necessity for increasing the lighting rate, and could be met each year out of the current rate without having to draw upon the reserve fund. The lighting rate was 3d. in the pound on property, and 1d. in the pound on land. It was very desirable that this be not increased; and under the terms proposed there would be no necessity to do so. After considerable discussion, it was unanimously agreed to accept the terms proposed.

Bideford Corporation and the Gas Company.—At the last meeting of the Bideford Town Council, Mr. Squire called attention to a recommendation of the Finance Committee that £100 be paid to the Gas Company on account of the lighting contract, and asked if any suggestion had been made that the Company should refund the sum of £7000 which had been overpaid for gas in recent years. It had been left to a Committee of the House of Commons to discover, during the discussion of the Gas Company's Provisional Order, that the Company had charged £7000 more than they ought to have done. This sum had been carried to capital account from the revenue—a thing which the Company had no right to do. By their Provisional Order, they were bound to supply yearly statements of account to the Town Council, whose place it was to protect the interests of the consumers. The Town Clerk having remarked that the accounts had been regularly supplied, Mr. Squire complained that they were not handed to the Lighting Committee, and said he looked upon this sum of £7000 as so much filched from the consumers. The Lighting Committee ought to look more carefully into matters, and make themselves acquainted with the Company's contract; but for three months there had been no meeting of the Committee, for want of a quorum. It was decided to pay the £100 due to the Company; Mr. Squire only voting against it.

Trial of an Improved Incandescent Burner in Southwark.—The Works Committee of the Southwark Borough Council have had under consideration a letter from the South Metropolitan Gas Company with regard to a new inverted burner, designed specially for use in streets, which gives a light of 120 candles, compared with the 80 candles of the present burners, and allows of a substantial reduction being made in the yearly charge for lighting. The Committee have given instructions for a number of the lamps in Borough High Street to be fitted with the new burner as an experiment.

Lighting, Limited.—A joint-stock company bearing the title of "Lighting, Limited," was registered on the 21st inst., with a capital of £1000 in ordinary shares of £1 each. Among the objects enumerated in the Articles of Association are the following: To carry on the business of making and selling apparatus for lighting, heating, ventilating, motive power, &c.; to manufacture, buy, sell, and deal in lamps, lanterns, burners, mantles, stoves, radiators, ventilators, &c.; to carry on the business of electricians, mechanical engineers, coppersmiths, brass-founders, &c.; to grant licences for using patents; and to acquier inventions. It is stipulated that the Company shall not offer any shares or debentures to the public for subscription. The registered office is at No. 25, King Street West, Manchester.

An Unjust Feature of the Old-Age Pension Scheme.—In the account of the recent explosion at the Hanley Gas-Works which appears elsewhere, it is mentioned that two of the injured men were taken to the Workhouse Infirmary. It appears that the Master of the house reported to the Board of Guardians last Wednesday that the men had expressed a desire to he taken to the North Staffordshire Infirmary, to which institution they had contributed out of their wages for 27 and 30 years respectively. The Master added that both men, without having any voice in the matter, had been made paupers, and would be disfranchised; and if they had been older they could not have had an old-age pension. It was decided to write to the Local Government Board to see if something could not be done to prevent the men being prejudicially affected on account of the relief they had received.

Interruption of the Bradford Water Supply.—The supply of water which Bradford receives from the upper reaches of the Nidd has lately been interrupted as the result of an accident to the pipe-line in the neighbourhood of Bolton Abbey. About three-quarters of a mile above the Strid, the conduit is carried across the Wharfe on a stone aqueduct, at the southern end of which the 36-inch iron pipe makes a bend upwards to climb the steep bank of the river. A subsidence of the ground at this point caused the spigot of one of the pipe-joints in the bend to be drawn from its socket, and the rush of water from the open joint under heavy pressure brought about the displacement of several of the adjacent sections. The water scooped out a hole in the bank, and washed away about 10 feet of the footpath. It also demolished a portion of the side walls of the bridge. The first intimation of the accident received by the Water Department was the unexpected cessation of the flow at the Chellow Heights reservoir at about four o'clock on Monday morning last week. Instructions were given by telephone to close the valve at the intake; but it was, of course, some time before the pipe emptied itself. Later in the day the Water Engineer (Mr. James Watson) visited the spot to inspect the damage, and men were at once set to work putting in position and rejointing the displaced pipes.

APPLICATIONS FOR LETTERS PATENT.

16,181.—Stopford, J. H., "Spring wire-clip for fastening globes in gas-fittings." July 12.

16,187.—Waterhouse, E., "Valve control for lighting purposes." July 12.

16,217.—Reynolds, A., "Gas-producers." July 12.

16,232-3.—M'Mullen, J. A., "Power-gas producers." July 12.

16,234.—M'Mullen, J. A., "Two-stroke cycle internal-combustion engines." July 12.

16,239.—Langhans, R., "Mantles." July 12.

16,243.—Kölnische Maschinenbau-Akt. Ges. and Wegescheidt, C., "Gas-purifiers." July 12.

16,248.—Lamont, J. H., and Smellie, A. R., "Pipe-joints." July 12.

16,258.—Naamlooze Vennootschap Bergen op Zoomsche Metaalwarenfabriek, and Milo, C. J., "Ignition devices for burners." July 12.

16,264.—Whitehouse, G. H., "Pipe-connection." July 13.

16,287.—Wilkinson, G., "Conveying condensed vapour from pipes." July 13.

16,339.—Jessel, W., "Bunsen hurner connection for gas-stoves." July 13.

16,341.—Delage, M., and Wocg, P., "Lighting gas-burners electrically." July 13.

16,342.—Seidner, J., "Compressor or exhauster." July 13.

16,355.—Wilton, G., "Treatment of gas for the recovery of useful products." July 13.

16,356.—Wilton, G., "Gas-generator plant." July 13.

16,357-8.—Wilton, G., "Carhonization or distillation of coal or other carbonaceous materials." July 13.

16,399-400.—Simpson, W., jun., "Producing air gas." July 14.

16,411.—Ede, E. P., "Street-lantern for inverted burners." July 14.

16,428.—Schwabach, G., and Gesellschaft für künstlichen Zug G. m.b. H., "Regulating device for gas-supply plant." July 14.

16,432.—Roots, J. D., "Rotary motor, pump, blower, or meter." July 14.

16,471.—Hammersley, J. D., "Gas-engines." July 15.

16,628.—Clerc, E. C., and Bidault, E. A., "Automatically lighting and extinguishing street-lamps." July 16.

16,647.—Beasley, C. H. & F. G., and Bradbury, R. H., "Recording gas-calorimeter." July 16.

16,699.—Rayburn, E. C., "Inverted burners." July 17.

16,713.—Noakes, H. W., and Whieston, A. N., "Mantle support." July 17.

A letter has been received by the Bedford Town Council from the Local Government Board refusing to extend from ten years the period for the repayment of the loan recently raised for substituting electric lamps for gas-lamps in the street lighting.

The Gas Committee of the Coventry Corporation have decided to contribute £15 towards the expenses incurred by the Society of Coal Merchants in bringing an action against the railway companies in respect of the recent increase of rates for the carriage of coal. This sum is in addition to the £15 already contributed by the Committee.

At a recent meeting of the Tramways and Electricity Committee of the Belfast Corporation, a resolution was read from the Gas Committee, asking that they might be given a share of the advertisements on the back of the tramway tickets, in the same way as the Electricity Department and Public Baths Department; and it was agreed to extend the same privilege to the Gas Committee for the year 1910.

Shortly after nine o'clock last Sunday night, volumes of smoke were observed issuing from three electric underground boxes at the corner of Essex Street, Strand. With the assistance of two Royal Naval Volunteers, the firemen at the sub-station opposite the Law Courts removed the plates, and it was found that the wires for 30 yards had fused. Sand was put down the boxes, but without effect; and eventually water from a hydrant was applied with success.

The employees in the Fittings Department of the Wolverhampton Gas Company had their annual outing on the 17th inst. at Weymouth. The party started on the previous night, and Weymouth was reached at 6 a.m. next morning. After breakfast, bathing, boating, and driving were indulged in up till noon, when dinner was provided at the Weymouth Hotel. A vote of thanks was accorded to the Directors of the Company; and it was decided to send a letter to the Engineer and Manager (Mr. P. G. Winstanley), thanking him for the interest he had taken in providing so many comforts to make the outing a success.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

BANK HOLIDAY.

In consequence of the BANK HOLIDAY, Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office

NOT LATER than the FIRST POST ON SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

COLLECTOR AND SURVEYOR. Hawick Gas Company.
METER INSPECTOR, COLLECTOR, &c. Woolton Gas Company. Applications by Aug. 4.
MANAGER AND SECRETARY. Shepton Mallet Gas-Works. Applications by Aug. 7.

Situation Wanted.

GAS COMPANY'S OFFICE WORK OR SHOW ROOM, &c. No. 5118.

Meetings.

BRENTFORD GAS COMPANY. St. Ermin's Hotel, Aug. 6, 2.30 o'clock.
COMMERCIAL GAS COMPANY. Cannon Street Hotel, Aug. 12, Twelve o'clock.
GASLIGHT AND COKE COMPANY. Chief Office, Aug. 6, Twelve o'clock.
SOUTH SUBURBAN GAS COMPANY. De Keyser's Hotel, Aug. 6, Three o'clock.

Stocks and Shares.

CINCINNATI GAS TRANSPORTATION COMPANY. Prospectus. List closes July 28.

TENDERS FOR

Coal.

HAVERFORDWEST CORPORATION. Tenders by Aug. 17.

Gasholder and Tank.

MILFORD HAVEN GAS DEPARTMENT. Tenders by Aug. 5.

Oxide of Iron.

SALFORD GAS DEPARTMENT. Tenders by Aug. 12.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 231.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment. £	s.	d.
£			p.c.				£	s.	d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17¾—18¼	..	5	9	7
298,955	10	,,	7	Do. 7 p.c.	12½—13	..	5	7	8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98*	..	4	0	0
200,000	5	May 27	6½	Bombay, Ltd.	5⅝—5⅞	..	5	10	8
40,000	5	,,	6½	Do. New, £4 paid.	4⅜—4⅝	..	5	12	5
50,000	10	Feb. 25	14	Bournemouth Gas and Water 10 p.c. . .	28¾—29¼	..	4	15	9
51,810	10	,,	7	Bournemouth Gas and Water B 7 p.c. .	16¾—17¼	+⅛	4	1	2
53,200	10	,,	6	Bournemouth Gas and Water Pref. 6 p.c.	15⅝—15⅞	..	3	15	7
380,000	Stk.	,,	12½	Brentford Consolidated	254—257	..	4	17	3
300,000	,,	,,	9½	Do. New . . .	195—197	..	4	16	5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	122—124	..	4	0	8
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	100—102	..	3	18	5
220,000	Stk	Mar. 12	10¾	Brighton & Hove Orig.	212—214	..	5	0	6
246,320	,,	,,	7¾	Do. A Ord. Stk. .	154—156	..	4	19	4
460,000	20	Apl. 16	10	British	43—43½	..	4	11	11
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c. . .	119—121	..	4	19	2
165,700	,,	,,	4½	Do. B 3½ p.c. . .	89—91	..	4	18	11
82,278	,,	,,	5½	Do. C 5 p.c. . .	108—110	..	5	0	0
5[illegible],000	,,	June 25	3½	Do. 3½ p.c. Deb. .	88—90	..	3	17	9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13½—14	−¼	5	0	0
250,000	Stk.	June 25	4	Do. 4 p.c. Deb. .	94—96	+2	4	3	4
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—		
100,000	10	—	—	Do. 4½ p.c. Pref. .	5½—6	..	—		
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6	1	3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5	7	2
157 150	Stk.	Feb. 25	5	Chester 5 p.c. Ord. . .	109—111	..	4	10	1
1,493,280	Stk.	Mar. 12	5 2/10	Commercial 4 p.c. Stk. .	108—110	..	4	14	6
560,000	,,	,,	5	Do. 3½ p.c. do. .	104—106	..	4	14	4
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3	12	3
800,000	Stk.	,,	5	Continental Union, Ltd.	96—98	..	5	2	0
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	+1	5	0	0
492,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4	1	4
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3	16	2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord. .	100—102	..	4	18	0
486,090	10	July 14	12	European, Ltd. . . .	24¼—24¾*	..	4	17	0
354,060	10	,,	12	Do. £7 10s. paid.	18¼—18¾*	..	4	16	0
15,161,545	Stk.	Feb. 11	4⅔†	Gas light and Coke 4 p.c. Ord. . .	104¼—105¼	+¾	4	8	8
2,600,000	,,	,,	3½	Gas light and Coke 3½ p.c. max. . .	88—90	..	3	17	9
3,799,735	,,	,,	4	Gas light and Coke 4 p.c. Con. Pref.	105—107	..	3	14	9
4,193,975	,,	June 11	3	Gas light and Coke 3 p.c. Con. Deb.	85½—86½	..	3	9	4
258,740	Stk.	Mar. 12	4¾	Hastings & St. L. 3½ p.c.	93—95	..	5	0	0
82,500	,,	,,	6¼	Do. do. 5 p.c	118—120	..	5	4	2
70,000	10	Apl 29	11	Hongkong & China, Ltd.	17½—18	..	6	2	3
123,5[illegible]0	Stk.	Mar. 12	6½	Ilford A and C . . .	141—143	..	4	10	11
65,780	,,	,,	5	Do. B	106—108	..	4	12	7
63,000	,,	June 25	4	Do. 4 p.c. Deb. . . .	102—104	..	3	16	11
4,940,000	Stk.	May 13	8	Imperial Continental .	179—181	..	4	8	5
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3	12	2

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment. £	s.	d.
£			p.c.				£	s.	d.
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c. .	120—122	..	4	18	4
561,000	Stk.	Feb. 25	10	Liverpool United A. .	226—228	..	4	7	9
718,100	,,	,,	7	Do. B . .	168—170	..	4	2	4
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	+1	3	15	6
75,000	5	June 11	6	Malta & Mediterranean.	4⅞—5⅛	..	5	17	1
560,000	100	Apl. 1	5	Met. of Melbourne 5 p.c. Deb.	100—102	..	4	18	1
250,000	100	,,	4½	Met. of Melbourne 4½ p.c. Deb.	101—103	..	4	7	5
541,920	20	May 27	3½	Monte Video, Ltd. . .	12½—13	..	5	7	8
1,775,892	Stk.	Feb. 25	4½	Newc'tle & G'tesh'd Con.	107½—108½	..	4	2	11
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	91—93	..	3	15	3
15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½—20	..	5	0	0
55,940	10	,,	7	Do. 7 p c	13—13½	..	5	3	8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	137—139	..	5	15	1
60,000	5	Mar. 31	8	Ottoman, Ltd. . . .	6⅛—6⅜	..	6	5	6
3[illegible],800	53	Feb. 25	13	Portsea Island A. . .	140—142	+2	4	16	11
60,000	50	,,	13	Do. B. . .	132—134	+2	4	17	0
100,000	50	,,	12	Do. C. . .	123—125	+3	4	16	0
114,800	50	,,	10	Do. D and E.	103—105	+1	4	15	3
398,490	5	May 13	7	Primitiva Ord. . . .	6⅞—7⅛	..	4	18	3
796,980	5	Jan. 28	5	Do. 5 p.c Pref. .	5 5/16—5 9/16	+1/16	4	9	11
488,900	100	June 1	4	Do. 4 p.c. Deb. .	94—96	.	4	3	4
1,[illegible]00,000	10	Apl. 29	8	River Plate Ord. . .	16—16½	+¼	4	17	0
312,650	Stk	June 25	4	Do. 4 p.c. Deb. .	96—98	..	4	1	8
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	14—14½	..	5	10	4
62,500	10	,,	6	Do. 6 p.c. Pref. .	12—12½	..	4	16	0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49½—50½	..	4	19	0
135,000	Stk.	Mar. 12	10	Sheffield A	236—238	..	4	4	0
209,984	,,	,,	10	Do. B	233—235	..	4	5	1
523,500	,,	,	10	Do. C	233—235	..	4	5	1
70,000	10	June 11	10	South African	13½—14	..	7	2	10
6,429,895	Stk.	Feb 11	5/6/8	South Met., 4 p.c. Ord.	122—124	..	4	6	0
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	84½—85½*	..	3	10	2
209,820	Stk.	Mar. 12	8	South Shields Con. Stk.	153—155	..	5	3	3
605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120—122	..	4	10	2
60,000	,,	,,	5	Do. 5 p.c. Pref. .	122—124	..	4	0	8
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124*	..	4	0	8
502,310	Stk.	May 13	5	Southampton Ord. . .	110—112	..	4	9	3
120,000	Stk.	Feb. 25	6¾	Tottenham and Edmonton A 5 p.c. .	132—134	..	5	0	9
423,940	,,	,,	5¼	Tottenham and Edmonton B 3½ p.c. .	111—113	..	4	12	11
149,470	,,	June 25	4	Tottenham and Edmonton 4 p.c. Deb.	99—101	..	3	19	3
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8	8	0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4	19	0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	111—113	+1	4	8	6
255,6[illegible]6	Stk.	Feb. 25	6½	Wandsworth B 3½ p.c. . .	139—141	..	4	12	2
79,416	,,	June 25	3	Wandsworth 3 p.c. Deb. Stk.	73—75	..	4	0	0
895,872	,,	Feb. 25	5¼	West Ham 5 p.c. Ord. .	123—125	+2	4	4	0
210,000	,,	,,	5	Do. 5 p.c. Pref. . .	126—128	..	3	18	2
253,300	,,	June 25	4	Do. 4 p.c. Deb. Stk..	105—107	..	3	14	9

Prices marked * are "Ex div." † Next dividend will be at this rate.

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For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

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Resists 4500° Fahr. Best for GAS-WORKS.
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SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
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MR. WM. CRANFIELD, F.C.S., in response to requests, has decided to extend the work he has been carrying on by Gas Classes in various Yorkshire Towns for the past Ten Years, and to organize postal courses of Tuition in "Gas Engineering" and "Gas Supply." Close personal attention will be given to the needs of each individual Student, and Expert Assistance has been engaged. All Inquiries treated confidentially.
Full Particulars on Application to No. 11, Avondale Place, HALIFAX.

ADVERTISER (Aged 35), of Good Address, requires APPOINTMENT. Having General Knowledge of Routine in Gas Company's Office, Hire Department, Meter Taking, &c., or in Show-Room of Gas Company or Fittings House. Good Credentials.
Address No. 5118, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the Supply of 1100 Tons of OXIDE OF IRON Purifying Material.
Full Particulars may be obtained on Application to Mr. Wm. W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Tender for Oxide," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 12th day of August, 1909.

L. C. EVANS,
Town Clerk.

Salford.

CORPORATION OF HAVERFORDWEST.
COAL.

TENDERS are invited for the Supply of about 1800 Tons of Double Screened GAS COAL of the very best quality, to be delivered at the Haverfordwest Railway Station, or at the Gas-Works Quay, Haverfordwest, by water communication, in quantities as required by the Gas Manager, during the Year commencing on Sept. 1, for the Corporation of Haverfordwest.
Tenders by Aug. 17, 1909.
Forms of Tender and further Particulars of

R. T. P. WILLIAMS,
Town Clerk.

Haverfordwest,
July 21, 1909.

MILFORD HAVEN URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE above Council invite Tenders for the Supply and Erection at their Gas-Works of a GASHOLDER and STEEL TANK.
Full Particulars may be obtained from Mr. R. J. Calderwood, Gas and Water Manager to the Council.
Sealed Tenders, endorsed "Tender for Gasholder and Tank," addressed to the Chairman, Gas and Water Committee, must be received by the undersigned not later than One o'clock p.m., on Thursday, the 5th day of August, 1909.
The Council do not bind themselves to accept the lowest or any Tender.

THOMAS H. LEWIS,
Clerk to the Council.

Milford Haven,
July 24, 1909.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Friday, the 6th day of August next, at Twelve o'clock (noon) precisely, to Transact the usual Business, including the Declaration of a Dividend for the Half Year ending on the 30th day of June last.

By order,
HENRY RAYNER,
Secretary.

Chief Office: Horseferry Road,
Westminster, S.W., July 20, 1909.

COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given, that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 12th of August, 1909, at Twelve o'clock at noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June, 1909; to declare a Dividend; and to elect an Auditor.
The STOCK TRANSFER BOOKS WILL BE CLOSED from the 30th inst. to the 12th of August, both days inclusive, and the Dividends will be paid on the 1st of September next to the holders of Stock registered at the date of the closing.

By order of the Board,
H. D. ELLIS,
Secretary.

Offices: Stepney,
July 21, 1909.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors will be held at the St. Ermin's Hotel, Caxton Street, Westminster, on Friday, the 6th of August next, at Half-past Two o'clock, to transact the usual Business, including the declaration of a Dividend for the Half Year ending the 30th of June last.

By order,
WILLIAM MANN,
Secretary.

Office, Brentford,
July 20, 1909.

SOUTH SUBURBAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the De Keyser's Royal Hotel, Victoria Embankment, London, E.C., on Friday, the 6th day of August, 1909, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th day of June last; to declare a Dividend for the same period; and for General Purposes.
The TRANSFER BOOKS WILL BE CLOSED from the 23rd day of July, until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

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TOTAL	27,720,000,000 cubic feet.

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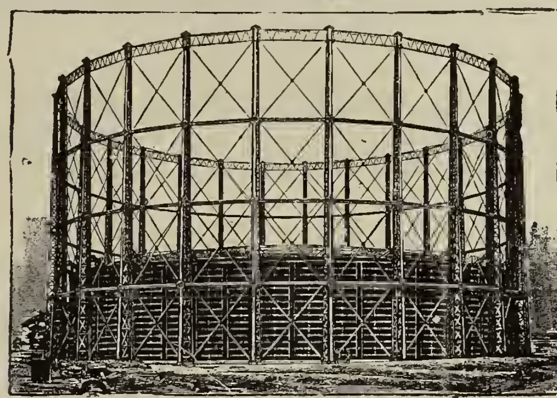

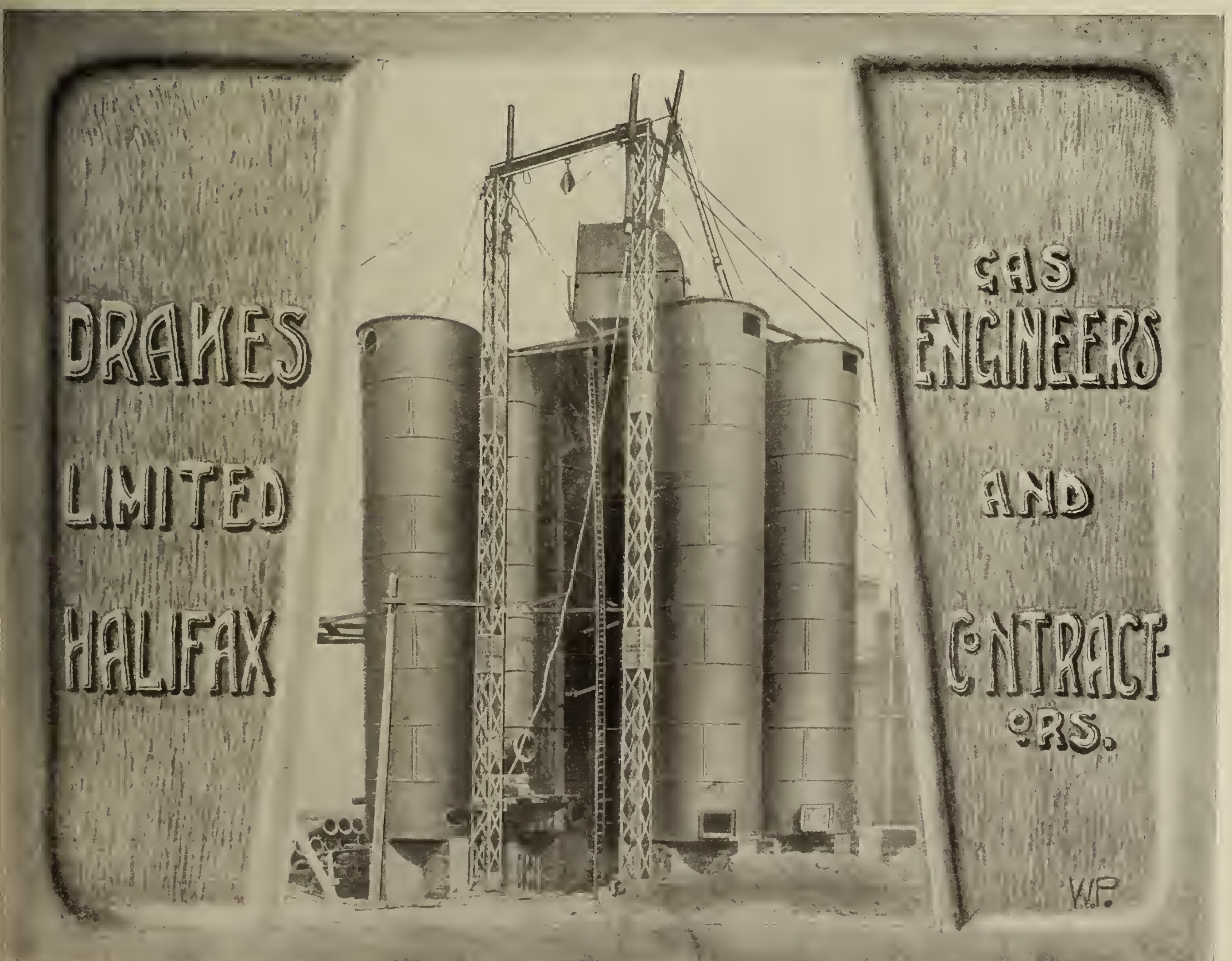
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GAS
ENGINEERS
AND
CONTRACT-ORS.
W.P.

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THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CVII. No. 2412.] LONDON, AUGUST 3, 1909. [61ST YEAR. PRICE 6d.

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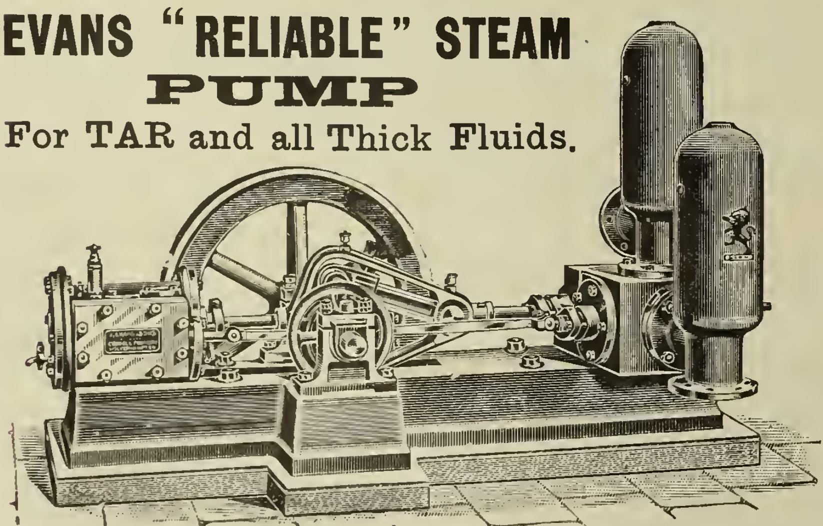

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVII., No. 2412.——TUESDAY, AUGUST 3, 1909.

EDITORIAL NOTES—GAS, &c.

Gaslight Finance and Working.

There has never been a half-year's financial and working statement in the whole history of the Gaslight and Coke Company that has given us greater pleasure to review (if we except the residuals section of the accounts) than that to hand for the past half year. We think it will be found that, despite bad trade and industrial depression, gas undertakings generally have not done at all badly in their financial results in the past half year; but the accounts that have been issued within the past few days from Horseferry Road are on their face, and more so on critical comparative examination, remarkable in more senses than one. We are glad of this—and we think all concerned will be, in the circumstances of the six months, proud of the fact—because it is the opening half year in the history of the undertaking as a co-partnership concern; and for the first time, therefore, charges appear in the accounts on behalf of the army of workers, which confer upon them (or rather upon the 8000 officers and workmen who have given their adherence to the scheme) a share, beyond mere defined salary and wages, in the prosperity of the concern. In view of this, workers, as well as proprietors and consumers, have to be congratulated on the financial position as disclosed by the accounts.

It is seen that, after setting aside £10,000 towards the redemption fund, and making a special contribution of £27,077 to the co-partnership fund, there remains a balance on the half-year's working of £339,872. The balance on the corresponding half year, however, was £406,434, after setting aside £10,000 to redemption fund and £10,000 to the insurance fund, the last named of which items there is no necessity to provide for in the present accounts, in view of the facts that claims on the fund are *nil*, and that a substantial amount already stands to its credit. But it is in comparing the balances of £406,434 and £339,872—showing a reduction of £66,562—that without care error will be committed. It has to be taken into consideration that during the past half year the price of gas has been 1d. per 1000 cubic feet less than in the corresponding period; and as the Governor (Mr. Corbet Woodall) calculates a penny reduction as representing, in round figures, £80,000 a year, it means that consumers contributed to the revenue something like £40,000 less in the past six months than they would otherwise have done. Adding to this £40,000, the special contribution of £27,077 for the co-partnership fund, and the co-partnership charge in the revenue account of £11,605 for the half year, it is seen that the decrease of the balance on the period's trading is much more than accounted for. But in these total financial figures there is more ground over which to write in a congratulatory vein. The balance brought forward from the previous half year being £423,324, there is an amount available for distribution of £763,196, against £755,984 in the corresponding period of last year. Out of the £763,196, the Directors recommend a dividend on the ordinary stock of £4 13s. 4d., which is an increase of 2s. 8d. per cent. on the corresponding half of last year, and this 2s. 8d. will absorb nearly £10,000 more. Nevertheless, the sum to be carried forward (£409,893) will be only £2405 less than a twelvemonth ago. This is all excellent, considering the provision for the co-partnership workers, the £40,000 given to the consumers in reduction of the price of gas, and the £10,000 increase required for the dividend. There we have the Co-Partnership trinity represented, and shown sharing in the Company's prosperity. It is in the cause of the security of this trinity, that there is so much activity in administrative enterprise.

In the making of the revenue account, the lower cost of materials came largely to the aid of the Company; but, even so, owing to the depressed state of the residuals market, the savings in the raw materials of gas manufacture do not, by £14,247, counterbalance the lessened income from residuals. But there is to be a further saving in the cost of raw materials in the current year; contracts having been entered into by the Directors for both coal and oil at prices lower than those paid during last year. In the half year, coal cost £583,697, or £78,502 less than in the corresponding period of 1908. This, however, was not all saving due to cost, inasmuch as the 849,875 tons carbonized was less by 46,493 tons than in the first half of last year. On the other hand, the £87,277 spent for oil was £4745 more, which indicates a larger make of carburetted water gas; the 7,723,826 gallons of oil and 111,911 gallons of spirit used representing increases respectively of 865,862 and 53,051 gallons. The coke and breeze consumed in the half year, costing £32,655, represented a decline of £5025; so that whatever the increased make of carburetted water gas, in the total it cost less than a twelvemonth ago. Wages and purification exhibited decreases; and an expenditure of £175,127 on repairs and maintenance of works and plant was a reduction of £8722. The total of the manufacturing charges (£996,851) was less by £98,464. But in the distribution department, the expenses have gone up in every item, excepting fittings for prepayment meter supplies; so that the expenditure in this department is higher in the total of £243,420 by £13,405. From this it will be gathered that, taking the whole undertaking through, the aggregate charges for repairs and maintenance have been well sustained. While mentioning this matter, an incidental reference may be made to the capital account, in which it is observed that, whereas the capital expenditure in the half year amounted to £45,213, there was a total deduction of £47,867, whereof £46,209 was in respect of depreciation of plant, meters, and stoves, and £1658 in respect of sale of surplus land. Reverting to the revenue account, there are few other items of interest on the expenditure side; the fluctuations being of small amount. Rates and taxes figure at £141,898; being an increase of £3433. There is the new charge for co-partnership of £11,605. Parliamentary costs are up by about £1000; this, it may be taken, being on account of the Bill now before Parliament, for, *inter alia*, the annexation of the West Ham Company and the reduction of illuminating power. Bad debts reach £9681 on this occasion; being £2175 more. The final result is that the total expenditure (£1,510,895) is down by £63,464.

The decrease in the half-year's disbursements reflects principally the improved conditions for the purchase of materials; the revenue side of the account reflects the downward course of coke in sympathy with coal, and the effects of trade depression in the sales of gas and residuals generally. In considering that the receipts for gas sold (£1,528,376) represent a fall of £29,274, the penny reduction—the equal of about £40,000—must not be forgotten. As a matter of fact, there was an increase of ¾ per cent. in the sale of gas; so that the decrease in the corresponding half of 1908 of ½ per cent. has been more than recouped. In volume, the sale of gas was 78,431,000 cubic feet more; the total having been 11,247,529,000 cubic feet. Taking the half year through, the atmospherical conditions—so frequently damp and cold—were not unfavourable to the sale of gas for domestic purposes. But, on the other hand, the stagnation in trade must have depressed consumption in several directions. The rental of ordinary meters was slightly lower; but there was an increase in stove-rental of £2430, and in fittings rental of £7548. The number of additional consumers connected up in the half year was 10,236; and the further gas-stoves sold and let on hire totalled to 15,387. The only cheerless part of the accounts is found in the receipts for residuals. They are in every branch consistent in presenting relapses. Coke fetched £248,811, a decline of £78,983; breeze £16,215, a decline of £5169; tar and tar products, £48,301, a decline of £3854; and ammoniacal liquor and sulphate of ammonia £92,606, a decline of £5024. These recessions in residuals income amount to £93,029; the total receipts from the department

being £405,934. The receipts from all sources amount to £2,083,496, or a decrease of £112,646, the greater part of which is, as seen, due to residuals. But of this, expenditure has saved £63,464, notwithstanding the £11,605 charged for co-partnership. Therefore the amount carried to the net revenue account, £572,600, is £49,183 less. Having regard to the trading conditions of the half year, the depression in the residuals market, the reduction in the price of gas, and the new charge for co-partnership, that the final difference on revenue account is not larger than it is is a matter for congratulation; and the fact that, though so much has been done, the carry-forward is only less by under £2500, is really, under the circumstances, a remarkable showing.

Financial Effects from the Retort-House.

When the proprietors of the South Metropolitan Gas Company meet the Chairman (Mr. Charles Carpenter) and his colleagues of the Board and officers to-morrow week, it will be their duty to express admiration for the accounts on the score that, financially, administration and working have totally annihilated the bad effect that the depressed condition of the residuals market has had upon income, to the end that the full sliding-scale dividend of £5 6s. 8d. per cent. can be paid, and yet leave a carry-forward of £66,726, though only a balance of £7371 was brought into the half year. This is highly satisfactory. But were it not that the expenditure under the heading of manufacture of gas calls for reference, and that the residuals receipts show some material changes, it would be possible to say that the accounts in other respects present such a striking similarity to those for the corresponding period of last year that comment is superfluous.

In the "Journal" for July 13, a letter appeared from the Chairman, which announced that he was a convert to the use of heavy charges in horizontal retorts. That letter may be read in conjunction with a statement in the Directors' report that there has been a saving of 30,000 tons of coal in the half year, due to improved gas-making methods. As a matter of fact, the total quantity of coal carbonized amounted to 570,075 tons, or a decrease of 32,234 tons; but a minor part of this is due to the 9 million cubic feet less gas sold, on a total sale of 6,286,736,000 cubic feet. The price of the coal, too, was somewhat lower; but the saving of 30,000 tons of coal, and the reduction of £71,491 in the total manufacturing expenses (£539,097), give us the supplement to Mr. Carpenter's letter, and at once put us in possession of the direction in which there is indebtedness for the improved financial result in a half year when residual products have done their best to cast a cloud over the trading. In no part is the considerable diminution in manufacturing costs attributable to a reduction of the item of repairs and maintenance of works and plant, seeing that the outlay under this head (£96,818) is £1047 more than in the corresponding half of last year. The two main items in the manufacturing expenses in which there have been decreases are in coal and carbonizing wages. The former, costing £368,695, is less by £63,375; and the latter, requiring £51,109, is lower by £6550. While mentioning the £63,375 reduction in the cost of coal, it is of interest to examine the relation that this bears to the lower receipts for residuals, in view of the fact that the report tells us that the saving in the cost of coal has been more than counterbalanced by the loss on coke and breeze. This we take to mean the cost on the quantity purchased, and not calculating that part of the saving due to the smaller quantity of coal required owing to the improved manufacturing results, which enabled 11,027 cubic feet of gas to be sold per ton of coal carbonized, which is the highest point attained in the history of the Company. The total receipts for residuals amounted to £249,410—a diminution on the accounts for the corresponding half year of £53,256, which was made up by the income from coke being £152,706, or £39,439 less; from breeze £4722, or £4498 less; from sulphate of ammonia £57,599, or £10,235 less; while the item of tar and tar products, yielding £34,382, was £917 more—the requirements for timber preservation having helped to maintain the average value of the tar products. Therefore it is seen that improved results from works, supplemented by the lower cost of coal, was more than equal to the diminished income from residuals.

Returning to the expenditure for the half year, the items of distribution vary up and down, with the final result that the £132,640 spent in this department represents an increase of £13,091. This is partly due to the additional facilities the Company are providing in the way of district offices and show-rooms; and they are proceeding with their water-slide chandelier conversion work to such an extent that no less than 20,000 have been dealt with since last Christmas. The attention that the Company give to the consumers, the facilities they afford for cheap repair and renovation of private fittings, and the free cleaning of gas-fires (including the supplementing of the ball fuel), we know, by independent testimony from various quarters, is very much appreciated. Rates and taxes amount to £45,608; being an increase of £3680. Included in the management expenses is the £2000 contribution by the Company to the Livesey Memorial Fund, and which contribution received the cordial endorsement of the proprietors at the last meeting. Slot meters are still an attraction to those who do not make any nice distinction between *meum et tuum*; but it is observed that the number of 5417 meters violated during the six months is smaller by 898 than in the corresponding period of last year. The total expenditure was £791,467, which is a reduction of £60,979—thanks to the manufacturing department.

On the revenue side of the account, it is seen that the sale of gas has been almost stationary—in fact, it receded slightly. The receipts from private consumers amount to £680,060, or £4920 less; while in the income of £17,485 for public lighting, there is an increase of from £300 to £400. From the profit point of view, the extra quantity of gas sold per ton of coal carbonized had a much greater salutary effect than the small retrogression in receipts has a detrimental effect. The Directors do not on this occasion explain the causes of this practically stationary condition; but they are doubtless chiefly due to the reasons described six months ago—the migration of residents farther afield, empty houses, and the inverted incandescent burner, not overlooking the bad trading history of recent times. It is not that the price of gas is high—it has been at 2s. 3d., and is now down at 2s. 2d.; and this reduction should assist in stimulating demand. To set against the stagnant condition of the gas sales in the half year, there are material increases in the number of the outlets for consumption. The meters connected now total to 341,359, an increase of 8413; ordinary stoves to 77,778, an increase of 1561; slot stoves to 191,550, an increase of 6905; and gas-fires to 23,582, an increase of 1451. The stove and meter rental on the half year (£67,999) is up by £1740; but the inflow from residuals, as already explained, is £53,256 less. The total receipts (including a new item of gas-fittings, £37,401) amounted to £1,053,958, which is a reduction of £18,777. Now if we deduct this from the lessened outlay of £60,979, there is a balance of £42,202, which is the sum by which the amount to be carried to net revenue account—£262,490—is higher than the sum transferred at the close of the corresponding period of 1908.

That is, in brief, the financial and working history of the Company for the half year; and it has its interesting and satisfactory features for the proprietors, and its lessons for gas engineers. On the indorsement of the accounts, there is no mention of a Chief Engineer. The blank will soon be occupied by the name of Mr. W. Doig Gibb, to whom, we have confidence in saying, the proprietors will extend a most cordial welcome.

Old Practices and New.

"In all ages, and at all times, in affairs of State, as well "as in the simpler affairs of every-day business and social "life, it has often been found necessary to ring down the "curtain upon old and familiar, though decadent scenes, "that it may be again raised to display new scenes better "fitted to the times, and modern in form as well as in "spirit." These were the words with which Mr. James D. Smith (of Stirling) concluded his Presidential Address last Thursday to the North British Association of Gas Managers. The spirit of the words appeared to permeate the whole of the proceedings at the meeting. We find ourselves, too, in reviewing the address and the papers submitted, doing so with the depth of meaning conveyed in the words directing our thoughts. Going at once to the address, the President, with little prelude, deals with the changes, which spell gain, in connection with coal carbonization for gas production. The advances of knowledge and the claims of the times have made it imperative that the curtain (as the President picturesquely puts it) should be rung down on old and familiar practices, and that it should be raised again on newer practices; and nowhere is this more true than in

Scotland, where, as is declared in the address, an old order of things is largely still indulged and tolerated, in spite of the developments that have made much of that old order of things redundant, inconsistent, and an impediment. But that is only true in places in Scotland, and as affecting a part of gas practices.

In the matter of carbonization, for instance, within the limits of opportunity, in several works the other side of the Tweed—apart from the two largest concerns east and west—there is practice that ranks with the very best. This is so at Stirling—the seat of the President's professional labours. While there is perfect accord with the President in his remark that the problem to-day before an engineer desiring to extend his carbonizing plant is a difficult one, and while there is sympathy with him in his complaint (a complaint that has been made before in these columns) as to the difficulty of compiling the results published from different systems of carbonization in such a manner that their relation shall be on a common level, and that their value may be adequately defined—admitting all this, we look to Stirling, Falkirk, Derby, and dozens of other places in the country, and discover that, difficulties notwithstanding, the modern proceeds of knowledge from the newer systems have spurred engineers into achieving, by small but not unimportant changes of practice, better results from their own existing plants, and, in fact, have directed to the proper way. Because vertical retorts have done much in revealing truth, there is no need to scrap present plant, and turn over to verticals. If verticals still prove themselves the superior of horizontal retorts worked in the light of present-day knowledge, the change-over will come about in the same gradual, but sure, manner that direct-firing has given place to regenerative firing. Looking at what the President himself is doing now with a horizontal bench of retorts, charged by the Toogood projector, it would be little short of madness to think of scrapping his carbonizing plant. He could not afford to do it for any productive gain to be at present obtained over the gains derivable by the current methods of working his own bench. This new bench at Stirling is equipped with all that is most approved in getting the maximum out of the coal in horizontal retorts, and yet Mr. Smith is not obtaining all that he might do, and will do, when a reasonable standard of illuminating power and a reasonable test displace from the pedestal on which they have all too long been exalted conditions that apply to other days. The bench is fitted with a Cowan governor, light seals are used, the mouths of the dip-pipes are turned to almost a knife-edge, and tar-towers are employed, and, accompanying, heavy and long-hour charges are now worked.

And what are the results: A substantial increase of gas is metered per ton of coal; an enhanced illuminating power by 1 or 2 candles is recorded by the photometer; an increased quantity of coke is obtained for sale; an additional quantity of tar (comparatively thin and oily), and a 25 per cent. increase in the yield of ammonia, are recorded. On top of these benefits, stopped pipes and naphthalene troubles are practically *nil*. And there is another point upon which the President did not remark, but it is obvious, and that is the saving of coal for a given make of gas. The President gives figures from which the fact can be deduced that, in the Company's last financial year ending May, the make of gas was equal to 11,069 feet per ton of coal working 8 to 9 cwt. charges of six hours' duration; and, using 0·75 gallon of benzol per ton of coal carbonized, a 20-candle power gas was supplied. Taking the figures in the Board of Trade returns for 1907, it is seen that (we assume the coal was of about the same quality) the make was only 10,360 cubic feet per ton of coal carbonized. The difference in profitable results between the old and the new practices as seen by these figures is considerable; but it does not end there. Since the close of the accounts in May up to July 12, the President, progressive in his investigations, advanced the weight of his charges to from 9 to 10 cwt., with a carbonizing duration of eight hours. His make of gas in this period has been at the rate of 11,789 cubic feet per ton of coal carbonized; and all the other results have likewise exhibited improvement, save one—the exception being that 1·11 gallons of benzol have had to be used per ton of coal to maintain the 20-candle power, or a difference of 0·36 gallon per ton. With the extension of the carbonization period, the President loses somewhat in his tonnage carbonizing capacity, but he saves in coal, and he gains in gas yield and secondary products, and apparently in labour. At any rate, he is well compensated in the financial benefits that accrue for the slightly smaller amount of coal that he can pass through his retorts in a day, owing to the heavier charges and the longer carbonization periods.

From this it is seen that Mr. Smith has, for good and all, rung down the curtain on the old carbonizing practices, and raised it on the new—with advantage; and he looks for a fresh opening by the discontinuance in Scotland of the apotheosis of high illuminating power, and the supplanting of the union-jet by the "Metropolitan" No. 2 burner for testing. He laments the slow progress in this regard in Scotland; but he is himself a disciple of progress, and an advocate for the removal of the handicap that he considers high illuminating power places upon gas undertakings. Recognizing this handicap, the Institution of Gas Engineers have his cordial support in the action they have taken, in conjunction with the Gas Companies' Protection Association, in urging upon the Board of Trade the passing of a General Act to place the testing of gas on a uniform basis throughout the United Kingdom. But better than this, while the President would rather that gas undertakings had complete liberty, and were allowed to base their fortunes solely on the satisfaction rendered to consumers, if test there must be, his favour lies in the direction of a calorific power one, so that the test would have relation to the purposes for which gas is in the present day used.

Gas production questions had quite a large part in the proceedings last week. Of such questions were the groundworks of the papers by Mr. William Wilson, of Falkirk, on "The Latest Practice in Horizontal Retort-Settings," and of Mr. Samuel Milne, on the "Installation of Carburetted "Water-Gas Plant at Aberdeen." In neither of these papers, being descriptions of structural work and plant, is there really anything for criticism. But they will be found extremely useful—both in suggestiveness and in practical assistance. Mr. Wilson is to be complimented upon the cheap extension that he made to his carbonizing plant, on the same ground space, by raising the height of the arches of a retort-bench, so that they would accommodate twelve retorts instead of eight, by which not only was the producing capacity largely increased (Mr. Wilson, by the way, also believes in heavier charges than formerly), but the fuel account was reduced. In the plan adopted by Mr. Wilson, he was fortunate in finding that the pier walls of the settings and the top equipment of the bench were respectively of a strength, character, and capacity that enabled him to make his extension upwards at a minimum of expense. For this he was indebted to the foresight of the late Mr. M'Crae.

Concerning the paper by Mr. Milne, its principal feature lies in the comprehensive description and working of an up-to-date carburetted water-gas plant, of the improved type of the Economical Gas Apparatus Construction Company. The paper was by no means inopportune. We are not sure that the future will not see water-gas plants of the various types take a larger part in the economies of gas production than in the past. They came to us largely for their convenience as the producers of a stable enrichment, and for their "collateral" advantages. Their stand-by value to a gas undertaking has been proved up to the hilt; as enrichers, with the progress of events to the place that gas was destined to occupy in the service of communities, they are losing ground. But their service can be commanded to the very antithesis of their original purpose; and there is little doubt that they will henceforth enter into considerable use in gas-works economies for breaking-down the illuminating power of gas to a point that is all-sufficient under the requirements of present times. Towards the end of his paper, Mr. Milne quotes working results, under the conditions of Aberdeen, which show the critical part that the price of oil plays in the relative costs of carburetted water gas and coal gas. That critical part will be largely eliminated by reducing the quality of the gas produced by the plant. But considering last winter's figures, which exhibit a disadvantage of 0·96d. per 1000 cubic feet as the cost in the holder compared with coal gas, it must not be overlooked that the water gas was of an average illuminating power of 25 candles, while the coal gas was of 20½-candle power. But with a drop in the price of oil of 0·82d. per gallon, the water gas this year will come out to about 13·35d. into the holder, as compared with 16·10d last winter. If, however, Mr. Milne was using his carburetted water gas to break-down his gas to the newly-acquired standard of 15 candles, what then would be the saving effected on the cost of his whole manufacture?

The paper read by Mr. Alex. Waddell, of Dunfermline, is a complete answer to the friendly criticism made last year

of his system for the automatic regulation of a high-pressure supply to a district 144 feet below the level of the gas-works, and extending some 4½ miles away. The credit of an original application that has worked for some months satisfactorily is his. The means of automatic regulation of the initial pressure at the compressor to the requirements of the district served, is by a return ⅜-inch block-tin tube, three miles long, running through the high-pressure main. By means of this tube, the pressure in the area of supply is continuously transmitted to the apparatus governing the speed of the compressor. It was felt that, considering the smallness of the diameter of the tube and its length, friction and deposit might cause irregularities in communication; but with the adjustment of a minor trouble or two, and an improvement in the safety bye-pass valve, everything has worked well; and Mr. Waddell's scheme of automatic regulation has—to date—been fully justified.

The Parade of the Miners' Power.

There was universal relief throughout the country towards the close of last week when the news was received that a national strike of the coal miners had been averted, through the yielding action of the Scotch coal owners—not (so far as the terms of the agreement indicate) from any unbending on the part of the men. But there are still doubts whether the settlement may be taken as ending, even for a time, all occasion for fear of disturbance through disagreement in the coal labour field. What has been transpiring lately shows the restlessness of the miners, and the desire to demonstrate their power in the country. There was a threat by the Miners' Federation to take the sense of the miners of the British Isles as to a general strike at the time of the recent Welsh dispute; and no sooner was this successfully disposed of, than the Federation turned their attention to the one between the Scotch miners and owners. The little northern cloud at once assumed large dimensions. It was also the Miners' Federation who pulled the strings over the Coal Mines (Eight Hours) Act. The arrogant and truculent attitude of the central organization in these recent affairs has made industry more than ever nervous as to the future; and for weeks now the whole country has been disturbed, and wavering between hopes and fears, as one day brighter rays were on the horizon and the next gloom, in the matter of the efforts in negotiation to bring about an amicable understanding between the Scotch owners and miners. In this matter, there has been a striking amount of inflexibility evinced. Under the main issue in the dispute, there are to be seen the movements that are to eventuate in a higher normal price for coal. The masters originally gave notice (within the terms of the 1904 agreement, and therefore they were within their rights) for a reduction in wages of 12½ per cent., to 5s. 6d. a day; while the men held out for 6s. a day being the minimum. As a matter of fact, the principle of a higher irreducible minimum per man per day was the chief issue. The masters' contention was that this could not be, in view of the fall in coal prices, and the heavier costs imposed now by the working of thinner seams, by the Compensation Act, by the Eight Hours Act, and by other causes.

Many conferences were held, there was perseverance in negotiation under the persuasive influence of the Board of Trade, and attempts were made to introduce the other available machinery in the way of arbitration and conciliation (which are good enough in their way, so long as the parties show a plastic disposition) to bring the parties to agreement. But until late last week conferences and negotiations had been in vain. On Friday evening, however, came success. The owners had previously conceded, for the sake of peace and in the interests of the nation, the principle of a fixed minimum of 6s. a day; and the only matters then outstanding were the conditions. Without traversing the details of the concluded agreement, it is sufficient to state that the question of the operation of the fixed minimum is to be subject to the conditions obtaining in the coal trade during the next eight months; and this is to be referred to arbitration—the Conciliation Board being continued, with a neutral Chairman. The agreement will remain in force until Aug. 1, 1912; and six months before that date and onwards, it is subject to termination at six months' notice.

Next to the settlement itself, the great event of the week was the parade of power by the Miners' Federation, which again for a time compassed the whole country with the fear of an almost immediate paralysis through a coal war. The result of the plébiscite that was taken—which gave the number of British miners in favour of a general stoppage in support of the claims of the Scotch miners as 518,361, and against as only 62,980, or about eight to one—shows that here there is a matter of great national gravity. The dispute affected Scotland, but not England; and no sufficient ground was ever shown for the intervention of the English miners. But the fact remains that this immense army of subterranean workers were prepared to make common cause by handing in their notices to stop work in order to bend the Scotch coal owners to the will of the miners, and thus bring disaster and misery on the whole country. This is the army of men whose pitiful powerlessness induced the Government to throw over them their ægis in the shape of the Eight Hours Act! Their power in the country is immense—the very nature of their work gives them peculiar strength; and the recent activities of the Miners' Federation in a militant direction indicate an intention of impressing upon the country and the coal owners the effective force and power that the miners as organized are in the land. However, whatever may be in store, we are thankful for the present peaceful ending, and that a general strike has been averted. But if there had to be a test of strength between the two parties to the dispute, then better now than in the dead of the winter. At any time the miseries produced by a coal war must be deep and keen, and the losses large; but they would be fearfully accentuated when the asperities of winter are upon us.

A Co-Partnership Suggestion.

The day is past when, excepting for the necessary purpose of again and again stimulating interest, there is call for advocacy in the gas industry of the principles and advantages of co-partnership. The principles are sound; and no one dares to assail them. The advantages are real, and in large part tangible. The incentives to the participators in the system are of a character that no other industrial scheme, however near to the borders of co-partnership it may lie, has yet succeeded in shaping and activating. This is being attested daily in the several Gas Companies that have constructed their affairs on the basis of a mutual interest between consumers, proprietors, and workers, after the lead given by Sir George Livesey and the South Metropolitan and the South Suburban Gas Companies. No matter to what co-partnership may come in magnitude, or in revolutionizing the relations of Capital and Labour, the honour of pioneers in, and of discoverers of, the ways to industrial peace can never be removed from those two concerns. The co-partnership dinner of representatives of the two Companies was held last Thursday, under the chairmanship of Mr. Charles Carpenter, with Mr. Charles Hunt in the vice-chair. There are two reasons on this occasion for a special reference to the proceedings. The first is that the question was asked some time since as to what would happen to co-partnership in these Companies when Sir George was removed. The answer is found in the unabated enthusiasm of all—from Chairmen, through chief and subordinate officers, to the rank-and-file of the workers. What has been done cannot now be undone; and where the flag of co-partnership was planted, there it will remain. The other point is a suggestion that fell from Mr. Hunt. The three London Companies are all now working under co-partnership, and on their borders are the South Suburban, the Croydon, and the Tottenham and Edmonton Companies. Before long, too, it may be expected the West Ham men will be brought into the co-partnership ranks through the amalgamation with the Gaslight and Coke Company. In view of London being such a large centre of gas co-partnership, Mr. Hunt hoped that at some future time it might be possible to enlarge the gathering at the Crystal Palace, so as to make it representative of all the co-partnership gas companies in and around London. The idea is not one that is impossible in its consummation. At the Palace there are Police Fête days, Foresters' days, Sunday School, Band of Hope, and Co-operative Festivals; and there is no reason, if desired, why there should not be a Gas Co-Partnership day. One thing is certain, that it would keep the world informed as to what has been, and is being, done in the gas industry in this great social and industrial reform; and it would keep the honour of it all green in the direction in which it rightly rests. Welcome is given by co-partners—selfishness is not one of their traits—to co-partnery in all industries. There is a proneness, however, for the newspapers and the public, in

the newer applications of the principles, to forget that the novelty has long since been worn off, and that the proof of success has been fully established in the gas industry.

Daylight Saving Bill.

It looks as though that hapless measure the Daylight Saving Bill is going to be shelved again this session. The inquiry, examination, and overhauling that the proposal has had to advance the clock on the third Sunday in April and to set it back again on the third Sunday in September, so as to make use of more daylight and less artificial illumination, have been of an order beyond which it would not have been necessary to go for a scheme of a much more momentous and elaborate character. Again this session it has been under investigation by a Select Committee, just as though prior inquiry had not been adequate. Now this Committee cannot agree on a favourable report. The Chairman the other day brought up a draft one favourable to the scheme; but the Committee would not entertain it. Over the matter there is in consequence a sort of deadlock. It may be expected therefore that the measure will be pigeon-holed once more. But those who are piloting the idea are not the people to abandon it. They are enthusiasts of the first water; and after every rebuff and every want of success, they come up smiling with an enlarged army of converts at their backs.

Gas Matters in Manchester.

We are able in to-day's issue to publish our customary summary of the report of the Manchester Corporation Gas Committee, and the accounts of the department, for the year to March 31 last, which we have received from Mr. F. A. Price, who, as readers are aware, recently succeeded Mr. Charles Nickson in the position of Superintendent. Mr. Nickson did not enter upon his well-earned retirement until a few weeks ago, so that the accounts for the past financial year, it may be mentioned, bear his signature as Superintendent. Turning to the report, one feature which will no doubt attract attention is the decrease of 2·41 per cent. in the quantity of gas transmitted from the works, as compared with the previous year. It must, however, be remembered that this decrease follows upon the heels of increases of 3·36 per cent. in 1908, just over 5 per cent. in 1907, and nearly 6½ per cent. in 1906. No doubt, in the past year Manchester has had quite its full share in the depressed conditions of trade by which all our industrial centres have been more or less affected; and the very fact that such satisfactory increases have been recorded of recent years, renders a set-back in times of commercial inactivity the more easily understandable. With the passing away of the clouds which have for some time overshadowed so many of the country's important industries, it may be, with some confidence, predicted that the Manchester Gas Department will go ahead again just in the same manner as it has been accustomed to do in the past.

Some Interesting Figures.

The percentage of unaccounted-for gas on the present occasion, it will be remarked, is somewhat smaller than was the case in the previous year—the figure being 3·24 per cent., against 3·54 per cent. There is recorded an increase in the number of consumers of 3352—the total being 174,290; while the number of prepayment meters fixed at the end of March was 58,041, or an increase of 1673. The amount collected during the year from the prepayment meters was no less than £74,041—represented by 17,769,958 pennies, weighing over 158½ tons. The proportion of the consumers who enjoy the free use of a cooker or griller continues to increase; the figure having now reached 44 per cent. The quantity of gas consumed by cookers in the past twelve months is estimated at the large amount of 613 million cubic feet, or an increase of about 7½ per cent. Engines—the number of which in use shows a slight falling off (which, again, may fairly be attributed to trade conditions)—were responsible for a consumption of some 390½ million cubic feet, or a decrease of 8·33 per cent. The cost of coal, cannel, and oil per ton carbonized shows a further increase on the rise recorded last year—the figure being 11s. 9·14d., against 11s. 4·17d. This increase was responsible for an addition of £10,653 to the cost of the 514,446 tons carbonized. The result of the operations, it may be remarked, is a gross profit of £140,022, as against £165,339; and a net profit of £89,873, compared with £116,181. Of this net profit, £60,000 has been paid over to the city fund in aid of the rates, in place of the previous £50,000; but it will be remembered that the smaller sum is to be contributed from the current year's profits. The income on the present occasion is £761,363, against £782,690 last year; while the expenditure is £621,341, compared with £618,702. For the purposes of the Committee's apportionment, a sum of £42,732 has been transferred from the reserve fund and added to the net profit.

The Definition of a "Trade Dispute."

The House of Lords have lately had before them a case which raised the question of what was intended when drawing up certain words contained in the Trade Disputes Act of 1906. The action, which has now been through the County Court, the King's Bench Division, the Court of Appeal, and the House of Lords, is of interest as affording a striking illustration of the injustice that can be perpetrated by individuals, as well as by organizations, in the name of Trade Unionism. The original plaintiff in the action was in the employment of a certain firm; and in order to compel him to pay a fine, and to punish him for not paying it, the foreman of the firm was induced to dismiss him, by the threat that unless he did so the Union men in the firm's employ would leave off work—which, however, was not true. The plaintiff, therefore, had to leave his work; and in the County Court the Jury awarded him £50 damages—finding that there was no trade dispute existing or contemplated by the men. A new trial was asked for by the defendant (who, though district delegate of his Union, was said to be acting without authority in the threats he uttered), and the Judge refused it, in which he was upheld by the Divisional Court These decisions, however, were reversed by the Court of Appeal on the ground that the action was not maintainable by reason of the Trade Disputes Act, 1906, which provides that "an act done by a person in contemplation or furtherance of a trade dispute shall not be actionable on the ground only that it induces some other person to break a contract of employment, or that it is an interference with business or employment of some other person, or with the right of some other person to dispose of his capital or his labour as he wills." This judgment, in its turn, has been upset by the House of Lords. The Lord Chancellor thought the meaning of the words "an act done in contemplation or furtherance of a trade dispute" was that either a dispute was imminent and the act was done in expectation and with a view to it, or that the dispute was already existing and the act was done in support of one side to it. An act done with a single eye to a dispute "in contemplation or in furtherance" of it, would not be actionable; but this his Lordship did not think applied to a case like the present one, which clearly was a mere attempt to "put the screw on" in the case of a single man. The moral to be drawn from the action is that, even now, there are limits within which Trade Unions or their representatives must keep if they wish to steer clear of troublesome consequences of their acts.

In the course of the report, reproduced in the "Journal" last month, of the deputation of the Streets Committee of the Corporation of London who recently visited certain cities on the Continent to inspect the public lighting, Vienna was referred to (p.178) as the "capital of the Austria-Hungarian Monarchy." Mr. W. H. Shrubsole, who has devoted much study to the affairs of both Austria and Hungary, writes to point out that they are two distinct and equal States which are allied to a very limited extent. He says there are two Thrones, two Crowns, and different laws in the two countries. Moreover, Austria and Hungary make treaties with each other, which could not be done if the two formed but one State.

We learn that the Committee of the "B. H. Thwaite Fund" have now received from Mr. Carnegie a cheque for his contribution of £500. The conditions which were attached to the offer—viz., that a further £500 should be forthcoming from subscriptions from those who recognized the value of the services rendered by the late Mr. Thwaite—had not been quite complied with; but Mr. Carnegie has not allowed the actual shortage in the amount to stand in the way. Mr. Thwaite's son, aged nine, has been elected to the Yorkshire Society School; and arrangements are being made for placing the daughter in a similar educational establishment. The Committee express their gratitude to Mr. Carnegie for his generosity and kind consideration, and their thanks to all who have assisted in the achievement of the results above recorded.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 341.)

Most markets on the Stock Exchange last week had an inanimate and featureless time. Business—beyond the settlement of the fortnightly account, which was happily not a formidable affair—was on a very light scale; and there was no factor calculated to inspire enthusiasm. It is true favourable dividend announcements threw a gleam of sunshine into the Railway Market; but this was counteracted by much apprehension regarding the coal difficulty. The unpleasantness in Spain arising out of Moroccan affairs was yet another dark spot. The opening on Monday was tame and spiritless. The gilt-edged division was dull; and Consols began a downward course, which continued as the week went on. But in some speculative lines, there was more life. Things were much the same on Tuesday; and fresh business was very quiet, with a dull tendency, though there was no very perceptible fall in prices. Rubber undertakings attracted attention. Wednesday was fairly busy considering how near at hand was the holiday break; but hardly any of the markets had any backbone in it. The weakness of Consols, the fading hopes of a coal settlement, and the upheaval in Spain were all depressing factors. Thursday opened weak, and under the influence of the same factors; but in view of the settled account and one or two rather cheering points, there was a moderate improvement before the close. With the settlement completed, and a long closure from Friday night till Tuesday morning before them, the attendance of members on Friday was scanty; and business was quiet accordingly. The Money Market exhibited no change; and the same easy rates held on with persistence unaffected by a good demand from the Stock Exchange. Discount terms were unchanged also. Business in the Gas Market was quieter and almost devoid of feature—quotations hardly moving. In Gaslight and Coke issues, the ordinary was steady, with transactions ranging from 104¼ to 105. The secured issues were busier. The maximum changed hands at from 88¼ to 89, the preference at from 105 to 106, and the debenture at 86⅜. South Metropolitan had a few dealings at 122 and 122¾. In Commercials, the 4 per cent. made 109½ and 108½ special, and the 3½ per cent. 104½ and 104 special. Among the Suburban and Provincial group, Bournemouth was done at 29 and 29⅛, ditto "B" at $16\frac{15}{16}$, ditto preference at 15⅝, Brentford old at 257, ditto new at 196¼ and 197, British at 43⅛ and 43¼, and South Suburban at 122. The Continental Companies were inactive. Imperial changed hands at 179¾ and 180, ditto debenture at 97, Malta at $5\frac{1}{16}$, and Tuscan at $9\frac{1}{16}$. Among the undertakings of the remoter world, Melbourne 4½ per cent. was done at 101¾, Primitiva at 6⅞ and 7, ditto preference at from 5½ to $5\frac{9}{16}$, and River Plate at $16\frac{3}{16}$ and $15\frac{13}{16}$.

ELECTRICITY SUPPLY MEMORANDA.

What Mr. Haydn Harrison Ought to Know—Deception of Individual Accounts—House Decorators the Friends of Gas—Fresh Efforts to Capture Cooking and Heating for Electricity—To Prevent Transfer to Private Plants—Hope! Hope on!

A fortnight ago criticism was made of an article written by Mr Haydn Harrison, and published in the "Electrical Times," in which were computations as to gas consumption and prices that we had no hesitation in labelling as crass absurdities. Mr. Jacques Abady went one better, by going direct to the columns of our electrical contemporary, and pointing out wherein Mr. Harrison had been incorrect in his assertions. This gentleman has deigned to notice Mr. Abady in a letter for which we thank him, as it confirms our estimate as to his ignorance of the course of affairs in the gas industry. The letter of Mr. Harrison is not to the point. As a matter of fact, he thinks to settle the matter by posting up his own righteousness, and sneering at the correspondent who seeks to administer a little monition. "Mr. Abady," he says, "trots out so many of the figures which appear to be the stock-in-trade of the gas industry, that I think any answer to it is quite unnecessary, as your readers are themselves in a position to know whether I am in the habit of making statements which are not corroborated in practice." As a photometrist, and as one with a practical experience of gas burners and mantles, we cannot admit that Mr. Harrison has an experience with any correspondence in extent to that of Mr. Abady; and as the firm with which the latter is connected are just as interested in serving the electrical as the gas industry with the scientific instruments they produce, there is a strong inclination on our part to put his impartiality on a higher level than that of Mr. Harrison. But the final lines of the brief letter of the latter gentleman seals the degree of his present knowledge of the trend of affairs in the gas industry." I note that Mr. Abady pins his faith on the inverted gas mantle. If this form of gas-burner is as satisfactory as he seems to think, why is it that it is so little used by the ordinary consumer?" If Mr. Harrison were behind the scenes, he would know rather more of the extent that the inverted burner and mantle are being adopted by the ordinary consumer. He would know something as to why mantle factories are now so busy making the inverted form; why it is that the makers of the burners have had to extend their means of production to meet the demand; why the factors all over the country have had to extend their capacity and accommodation for dealing with the inverted burner business; and why it is that makers of gas and electric lighting fittings in the Birmingham district are busier turning out brackets and pendants for the inverted gas-burner than any other form of lighting fitting. The reason is that the inverted burner offers a greater efficiency, a lower gas account for lighting, a lower consumption of mantles, than anything yet offered for domestic use, and at a less annual cost; and, above all, to get these benefits, their houses have not to be wired—the existing gas-piping suffices.

The stupidity of the practice of taking the lighting accounts of any single house as a testimony of what can be done by any system of lighting, without quoting the hours of use, is illustrated by the "West Ham Electrical Bulletin," though the ex-Sales Manager (Mr. H. Holmes) has been very fond of doing this. Without being acquainted with the hours of use, a comparison between one period and another, or between house and house, or between lighting system and lighting system is unreliable; and particularly is it so when electricity is compared with gas, and there is lapse of memory causing omission of factors as to whether ancient flat-flame burners are still in use, or whether gas cooking and heating stoves are employed. The accounts published by the "Bulletin" are not comparisons with gas; but the plain accounts of seventeen consumers in one road who use electricity—whether entirely is not stated. Being all in one road, it may be assumed that the houses are of one class, and their rental is stated to be about £60 a year. Some of them must be very poorly lighted. Take one designated "B." It contains only two 8-candle power carbon filament lamps, ten 16-candle power ones, and two 32-candle power Osrams; and the year's account comes out to £2 3s. 9d.! It is impossible for a £60 a year house to be adequately illuminated for this sum for a whole year with electricity at 3d. per unit. The maximum possible hourly consumption of these lamps is 784 watts. A little lower down in the table is consumer "F," who has four 8-candle lamps, eight 16-candle ones, and eight 32-candle Osrams. The maximum possible hourly consumption here is 960 watts; but the lighting account is £8 5s. 3d.—only about 20 per cent. difference in maximum possible wattage, but over 70 per cent. increase in actual annual cost for current. Showing again how little reliance can be placed on individual accounts without knowing the hours of use, compare the figures of "B" (already given) with case "E," in which are connected six 8-candle carbon filament lamps, eleven 16-candle power lamps, and two 32-candle power Osrams. The year's cost in this case is £7 8s. 6d., compared with £2 3s. 9d. in case "B." Take case "D," in which five 8-candle power lamps, eleven 16-candle power ones, and nine 32-candle power Osrams are used, the cost is only £4 0s. 6d. But in case "P," the consumer uses 24 8-candle power carbon filament lamps (the equivalent of 27 is used by "D") and nine 32-candle power Osrams (the same as "D"), the year's bill comes to £8 7s.—more than double "D's" account, although the equivalent of three 8-candle power lamps less arc used. One of our electrical contemporaries points out that the average bill of the seventeen houses is £5 3s. 5d. But what is the good of speaking of an average when the individual accounts are so widely discordant? It is also remarked that, if Osram lamps were used throughout these houses, the average yearly cost might easily be brought below £4—"a figure which gas would find it hard to beat." How so, when £4 with electricity—taking West Ham prices—at 3d. per unit will only pay for (using Osrams) 256,000 candle-hours, while £4 of gas at 2s. 8d. will purchase at least (using it in the new inverted lamps) 600,000 candle-hours?

We have just learned, with the utmost satisfaction, that house decorators are the friends of gas suppliers, and not of electricians, on the same ground that the chimney sweep is the friend of the coal vendor, and not of the gas supplier. We all have our friends and our enemies—in the sense of the word as bounded by competition and selfishness. The reason, we are told, why house decorators love gas rather than electricity is that "while the decorator was usually sent for annually before the installation of electric lighting into premises, the decorations after the installation last for many years." But the decorator must surely be wavering in his love for gas; for with the considerable extension of the use of bijou and medium size inverted gas-burners, and even larger sizes (where the hot currents have lateral escape from the top of the burners and do not have smart vertical ascent to the ceiling), ceilings and wall papers continue clean so long that people are pleased to have rooms redecorated for a change—if not for sanitary reasons. Even the office of the West Ham Electrical Engineer was undergoing a thorough spring clean recently—so thorough that certain papers got mislaid that Mr. Ross Hooper would have been very pleased to inspect.

Central station engineers are still wrestling with the problem, and will continue to do so until they weary of the task, of how to maintain revenue from householders by inducing them to use more units in view of the consumption reducing power of metallic filament lamps. It is a large and momentous problem; and all sorts of ineffectual ways and means have been devised for attacking it. The difficulties are that the shrinkage of revenue per house represents also a shrinkage of return on the capital expenditure per house; and, furthermore, if revenue compensation is to be obtained *viâ* cooking and heating, the electricity itself will be far less profitable than if used for lighting. To compensate in revenue for one lighting unit, three, four, or five units at a penny apiece must be consumed for cooking or heating, and those three, four, or five lighting units will cost more to produce and deliver than one lighting unit. Moreover, this class

f cheaper unit consumption is only to be obtained by introucing a duplicate system of wiring and measurement, which gain reduces the value of the business as a profit-producing ieans. However, these difficulties notwithstanding, we are told iat it is in this direction central station engineers are, in the our of their need, lifting their eyes, and that the business is ɔ be worked for all it is worth. Perhaps it would be uncharitible to hope it will be; seeing that, through it (taking all points ffecting it into consideration), the station engineer is more likely ian not to get himself and his finances into a worse tangle than ow. One venturesome writer predicts that "electric cooking and eating will during the next year make more progress in popular ivour than they have during a century." But the days of miracles re over. Heat units that are not in electricity cannot be obtained :om it. Much more must be got out of electricity than is in it ɔ enable it to effectually compete with solid and gaseous fuels. Jevertheless, many station engineers are trying their luck at etting connections for cooking and heating, though so far success as not been great. The price of the appliances is one of the rawbacks; and it is understood there is a movement afloat for ie amalgamation of certain electric supply undertakings for the urchase of cooking and heating appliances, so that the makers 'ho secure the joint order can produce under the most economial conditions, and so be in a position to sell their goods at a more easonable price than now. All these efforts will be kept well in iew by gas suppliers.

Some time ago reference was made to the trouble that elec-ricity suppliers were experiencing by reason of owners of large stablishments finding out that they are paying exorbitantly for lectricity for lighting purposes, and that energy can be obtained iuch cheaper per unit by putting down a private plant with a as-engine as the prime mover. One or two of the London Comanies were complaining of this six months ago. The suppliers f electricity are in this matter on the horns of a dilemma. They harge a high price per unit to large consumers for lighting for ie same electricity that they charge a low price for to smaller sers of energy for power purposes. The large consumers for ghting naturally say, "If you can supply the power consumers t that extraordinarily low price, why cannot you supply us at a reater rebate than you do from the ordinary charge for lighting urrent?" They cannot understand the various factors that lectricity suppliers take into account, or are supposed to take ito account, in settling prices. Anyway, it follows that, if the ower consumer can generate from a private plant with advantage ɔ himself, the large long-hour lighting consumer should be able ɔ do so, inasmuch as he has to pay for town-distributed current :om 100 to 300 per cent. more than the power user. Electricity uppliers cannot resist this argument. Many an electricity underaking has lost a considerable consumer because there has been ttempt at resistance; and the latest to find that resistance is no onger prudent is the Marylebone Borough Council. The Elecricity Supply Committee have reported that, owing to competiion with private plants, it has been found necessary to arrange o give special terms to those consumers who have a maximum lemand of 50 kilowatts and upwards, and who are prepared to nter into an agreement for at least ten years. The decade's greement shows a marked prudence, if it does not have the ffect of making the large users of electricity "cry-off."

A big ambition is quite the proper thing. Last week we were eviewing a book on "Electricity for Everybody," in which the vriter said the time would undoubtedly soon be here when about 5 per cent. of the buildings in every city and town would be wired or some application or other of electric light, heat, and power. There is nothing like having a good opinion of oneself. In the ast Industrial Supplement of "The Electrician" an article ippeared headed "De Omnibus Motorum," in which the writer :ommences in a profoundly pessimistic tone, and winds up in a nost optimistic spirit. That, too, is quite the proper thing; and t adds to the gaieties of our competition to find our opponents ire not perpetually ill at ease. The first lines of "De Omnibus Motorum" run thus: "At the present time, it is certainly hard or anyone connected with the electrical industry to feel very ptimistic about the future." That is rather painful; but after wading through the article, we come to these final sentences, which breathe of a blessed future: "There is certainly no lack of missionary work for us to do. And with us lays the onus of ealizing within as short a time as possible that 'electric city,' ind that electric country, too, in which smoke stacks will be ew and far between, perhaps non-existent altogether; where the electric-drive will be universally employed in factories; electricity or lighting and heating purposes in all houses; and the present much too serious pollution of the atmosphere will be mitigated." While the electricians are talking about it, the gas industry is busy putting in cooking-stoves and gas-fires, and supplying apparatus of many kinds for industrial purposes. Does our recollection play us false? If not, there are about 600,000 gas cookingstoves on hire in the three London Gas Companies' areas, without those privately possessed.

The Bury St. Edmund's Managership.—Out of a number of candidates for the position of Manager of the Bury St. Edmund's Gas Company, in succession to Mr. A. Mitchell, for which applications were invited in the "Journal" for the 29th of June, Mr. A. F. Young, of Cockermouth, has been selected; and he will enter upon his duties next month. Mr. Mitchell will retain the Secretaryship of the Company.

ELECTRICAL DISCOURTESY.

The "Electrical Times" has published a comment this week on the articles that have appeared in our columns, recording, on Mr. G. F. L. Foulger's retirement from the position of Chief Distributing Engineer of the Gaslight and Coke Company, some of the incidents in his professional career. The comments of our contemporary conclude as follows:

> We are able to add that in all this vigorous career of stalwart gas proselytism, perhaps the most interesting of the incidents known and disclosed is that which succeeded Mr. Foulger's farewell ceremony and presentation. He promptly had his house in Clapton fitted from top to bottom with electric light.

In reference to this statement (which, to say the least, cannot be regarded as in the best of taste), Mr. Foulger has asked us to publish a copy of a letter that he has addressed to

[Copy.]

The Editor of the "Electrical Times."

Sir,—My attention has just been drawn to a reference to myself which appears in your issue, bearing date the 29th inst. I must leave the matter of your comment to your readers to judge as to whether or no your allusions in regard to my private matters are fair or in good taste. If, however, the suppliers of electricity are in such a condition that they have to sacrifice all courtesy, and embrace every opportunity (fair or unfair) in order to bolster up the commodity they deal in, I suppose I must consider myself flattered that the temporary use of electric current is expected to stand them in such good stead as to necessitate so wide a reference to my action in using it.

The facts are as under: I have just retired from active service in the Gaslight and Coke Company, but am still retained in a consultative capacity. Having, last October, gone through a serious operation, I was naturally indisposed to continue the tenancy of a house which recalled to me all I had gone through in it. In compliance, however, with a promise to my Directors that I would not leave London until my successor in office had been in his position for some little time, I took, temporarily, a house within a few doors of my old one. This house was already wired throughout for electric light. Naturally it would not have answered my purpose to have carcassed the premises with gas-pipes for so short a tenancy as I have agreed for. Apart from this, and with my recent experience of electricity, I should certainly have installed inverted incandescent gas in preference.

Although I consider your references to my private affairs unprofessional, I hope you still possess a sufficient store of that commodity, fairness, to give equal publicity to this letter that you have given to your references which have called for it.

Upper Clapton, N.E., July 30, 1909. (Signed) G. F. L. Foulger.

PERSONAL.

Mr. Alexander Watt, of Banchory, has been appointed, out of forty-eight applicants, Manager of the Alyth Gas Company, in the room of Mr. Andrew Robertson, resigned.

The commemoration of the centenary of the birth of Ferdinand Redtenbacher, formerly a distinguished professor at the Technical College at Carlsruhe, was made the occasion for the conferment of a number of honorary degrees. Among those selected was Herr Emil Blum, the General Manager of the Berlin Anhalt Engineering Company, who received the honorary degree of Doctor of Engineering.

A special meeting of the Streets Committee of the Corporation, which deals with the lighting of the City of London, was held last week for the purpose of selecting a Chairman to fill the vacancy caused by the sudden death of Mr. Alfred C. Teuten, as referred to in our last issue. The result was the election of Mr. John Stopher, who is a past Chairman of the Committee, having held that office during 1907-8. The new Chairman has always taken a great interest in the public lighting—having been one of the deputation appointed to visit the Continental cities with respect to this matter, and one of the signatories to the report recently issued with regard to the future lighting of the City of London.

A number of members of the Royal Agricultural Society visited Woburn last Thursday to inspect the progress of the experiments being carried on there. Fields of wheat and barley, where continuous crops have been grown, were seen. The conclusion arrived at was that wheat and barley could be grown on the same land continuously if proper manures were used; these being a combination of mineral manures with nitrogenous salts, such as nitrate of soda or sulphate of ammonia, or else organic manures, such as farmyard manure or rape dust.

We are interested to learn that the winner of the first prize in the honours grade of the last "Gas Engineering" examination, Mr. William A. Howie, who is a native of Kendal, and 22 years of age, is indentured to Mr. T. H. Duxbury, of South Shields, having been articled to him some four years ago. It was Mr. Howie's first sitting for the gas examinations. Mentioning this matter affords an opportunity of expressing regret that the pass lists and prize lists in these examinations give no indication of the towns in which the various candidates live, but only of the place at which they attend for examination purposes. This is a point to which attention has been drawn on previous occasions.

THE GASLIGHT AND COKE COMPANY.

Half-Yearly Report.

The following is the report on the working of this Company during the six months ending June 30, which, with the accounts (an abstract of which appears on p. 334), will be submitted to the proprietors on Friday.

The accounts for the past half year show that, after providing for fixed charges, setting aside £10,000 towards the redemption fund (in accordance with the provisions of the Company's Act of 1903), and making a special contribution of £27,077 17s. 3d. to the co-partnership fund, there remains a balance of £339,872 0s. 9d. The amount brought forward from the previous half year being £423,323 17s. 11d., there is a total sum available for distribution of £763,195 18s. 8d., out of which the Directors recommend a dividend on the ordinary stock at the rate of £4 13s. 4d. per cent. per annum, which will absorb £353,302 14s. 4d., and leave the sum of £409,893 4s. 4d. to be carried forward to the credit of the current half year.

The sales of gas for the half year show an increase of ¾ per cent. compared with the quantity sold during the corresponding period of 1908. There has been an addition during the six months of 10,236 consumers, and an increase in the number of gas-stoves sold and let on hire of 15,387.

The Directors have to report that contracts for the supply of coal and oil for the next twelve months have been made at prices lower than those paid during the previous year.

The Company's Bill in Parliament for the acquisition of the undertaking of the West Ham Gas Company has been read a third time in the House of Commons, and has been passed by a Committee of the House of Lords.

The co-partnership scheme, mention of which was made in the last report, has now been established, and over 8000 officers and workmen have been admitted as co-partners.

The Directors regret to announce the death of their esteemed colleague Mr. Howard Charles Ward, who was for 45 years a Director, and for 26 years Deputy-Governor, of the Company. Mr. Joseph Lister Godlee, Chairman of the West Ham Gas Company, has been elected to a seat on the Board. Mr. Ulick John Burke, who has long been connected with the Company, has been elected Deputy-Governor.

The Court of Directors has been furnished by the several Engineers of the Manufacturing and Distributing Departments respectively with the usual certificates that all the Company's plant has been maintained in thorough efficiency.

Horseferry Road, Westminster, S.W., July 19, 1909. Corbet Woodall, Governor.

SOUTH METROPOLITAN GAS COMPANY.

Half-Yearly Report.

The following is the report of the Directors of the Company for the six months ended the 30th of June, which, with the accounts [see p. 334], will be presented to the proprietors at the ordinary half-yearly meeting on the 11th inst.

1.—After payment of the full sliding-scale dividend at the rate of £5 6s. 8d. per cent. per annum, the profit on working provides a sum of £66,726 to be carried forward. This result has been achieved notwithstanding the fact that the sales of gas have been practically stationary during the period under review. It is, however, anticipated that the reduction in price from 2s. 3d. to 2s. 2d. per 1000 cubic feet from Midsummer last will tend to stimulate an increase in consumption.

2.—Coal has been cheaper, but the saving in cost has been more than counterbalanced by the loss on coke and breeze. The disturbed condition of the coal trade, due to the introduction of the Mines (Eight Hours) Bill, is the cause of much anxiety, and has necessitated carrying heavy stocks in order to provide against possible interruption of supplies.

3.—Residual products have yielded considerably less; both coke and ammonia having fallen in value. The price received for pitch has also been low. On the other hand, the world's requirements of creosote for timber preservation have helped to maintain the average value of tar products. Improved gas-making methods have brought about a saving of 30,000 tons of coal in the half year, and consequently modified the return from residuals. The quantity of gas sold per ton of coal carbonized has been 11,027 cubic feet—the highest figure yet reached in the Company's history.

4.—Distribution costs do not show any diminution, but the improved facilities furnished thereby are increasingly popular. The policy of providing local offices and show-rooms in various parts of the Company's district has been found advantageous, and is being extended. More than 20,000 water-slide chandeliers have been altered at the Company's cost since Christmas last, and every endeavour continues to be made to eliminate the use of such unsafe appliances.

5.—A sum of £2000 has been contributed to the fund that is being raised to perpetuate the memory of the late Sir George Livesey by the endowment of a Chair of Gas Engineering named after him at the University of Leeds. There are many problems in the gas industry awaiting systematic and scientific investigation, the benefits arising from which will be felt by this Company in common with other gas undertakings.

6.—The Board consider this a favourable opportunity to write-down the reserve and insurance funds to their present market values. The practice hitherto has been to bring forward as the respective balances of these funds the total of the amounts from time to time transferred to their credits *plus* interest. Owing to the fall in trustee securities generally, the amount invested would not now be realizable by their sale; and they have, therefore, been brought in at the reduced figure.

7.—The advantages of co-partnership are emphasized as time goes on and experience under it increases. This Company may well be proud of having been twenty years ago the pioneer among gas companies of a movement which is now generally recognized as a remedy for many, if not all, of the difficulties attending a true fusion of interests between capital and labour.

8.—Mr. W. Doig Gibb has been appointed to fill the vacant post of Chief Engineer. Mr. Gibb occupies a similar position with the Newcastle and Gateshead Gas Company, and it is believed there will be found in him the requisite qualifications of age, experience, and ability. Mr. James D. C. Hunter has been elected an Employee Director in place of Mr. Charles Drumgold, who resigned on his promotion to Chief Storekeeper.

Charles Carpenter, Chairman.

709, *Old Kent Road, S.E., July* 28, 1909.

THE WEIGHING OF CARGOES OF COAL AND OTHER MATERIAL.

The Porhydrometer.

The quantity of material for the shipment of which gas undertakings—both at home and abroad—are responsible is considerable; and several undertakings are the owners of vessels and barges for the transport of their material. As buyers and sellers and shippers, the question of the weight of cargoes is an important one to the gas undertakings concerned; and anything that can be done to save labour and time in this connection, and simultaneously to ensure accuracy and ready checking, means money. For example, a large part of the coal purchased for gas making—and 15½ million tons were bought in the year of the last returns for home consumption by statutory gas undertakings alone—is sea-borne; and to this has to be added the large amount of British coal shipped for use by gas-works on the Continent and further afield. Besides coal, there are the shipments of the bye-products and other materials, the weight of all of which in and out of the vessel has to be ascertained and checked.

This is sufficient to show that the gas industry has an interest in an instrument to which claim is laid that it will measure, with the utmost accuracy, the dead-weight placed on board, or removed from, any ship, barge, or other floating vessel to which it is fitted. This instrument is called the "Porhydrometer." We do not like the name; but the choice belongs to others. The inventor of the instrument is Signor de Lorenzi; and while in the greater part of the mechanism there is nothing new, in the application of the combination of mechanism and principle, there is ingenuity, simplicity, and (it seems to us) novelty. If, too, the instrument satisfies shipping experts, no cargo-carrying vessel will in the near future be complete without it. The principle upon which the instrument is based is the infallible one that a body floating in a liquid of whatever density displaces a quantity of liquid exactly equal to its weight. By its application the vessel is thus transformed into a gigantic weighbridge or weighing-machine.

In the centre of the vessel a vertical tube is fitted, extending from well below the light draught water-line to well above the load-line, and connected by a pipe with the outside shell of the vessel, so that, when the valve or cock is opened, the water in which the vessel is floating has free access to the vertical tube, and rises in it to exactly the same level as outside the vessel—the water or liquid both in the tube and outside the vessel being thus of the same density. Inside the vertical tube is fixed a vertical float, called the aërometer, which, having exactly proportionate horizontal areas at the various immersions to the areas of the planes of flotation at the same draughts or immersions of the vessel, has an exactly similar displacement, and reduces the enormous weights dealt with to a measurable quantity. The aërometer being immersed in the same liquid to the same extent as the vessel itself, by its consequent exactly proportionate displacement, loses an amount of weight exactly equal to its displacement. This loss of weight disturbs the balance of levers, and is exactly registered or counterbalanced by moving the weights along the steelyard, giving a reading of the weights placed on board the vessel, and *vice versâ* weights removed. The tube being fixed in the centre of the vessel, neither transverse inclination nor change of trim, it is said, will affect the accuracy.

Briefly stated, the advantages of the instrument to the ship-owner, charterer, and shippers are claimed to be important in both saving and protection, as will be seen from a consideration of the following points that are submitted by those interested in the invention: "(1) The cargo is accurately weighed in one operation. (2) The captain or officials in charge are at all times in a position to ascertain the weights on board. Coal taken at a

coaling port can be weighed correctly. In various foreign ports, it is well known that a full ton of coal is rarely if ever supplied. In Mediterranean ports, a shipowner rarely receives more than 15 or 17 cwt. to the ton. (3) In case of leakage through collision, grounding, or any other cause, the element of danger, and capacity of the pumps to cope with it, can be accurately gauged, and the course regulated accordingly. (4) The instrument cannot get out of order or lose its accuracy. (5) By weighing total cargoes in one operation, or parcels of goods loaded or discharged by themselves, when they are completely placed on board, or taken from the vessel, a great saving in cost is effected. (6) For the same reasons, the loading or discharging can be carried out with very much greater rapidity, resulting in the reduction, if not complete avoidance of, demurrage. (7) Its great simplicity. (8) It is invaluable for checking the amount of water in the ballast tanks. (9) The density of the water does not affect the accuracy of the instrument."

We understand that the "Porhydrometer" can be fitted to any vessel of any type, whether large or small, or for sea, river, or lake service; and that the cost of installation is small. The Italian Government has tested the invention, and has approved of it, and, further, has decreed that the customs shall accept as correct the weight of cargoes measured by the "Porhydrometer." This means that instead of a shipowner paying 23 centimes per ton for the customs' weighing dues, he has only to pay 8 centimes—saving nearly 200 per cent. in Italian ports. With regard to the point as to protection, the instrument having attached to it an electric bell, when a leak is sprung, a warning is given by the ringing of the bell. The fact of knowing the extent of a leak is unquestionably of great importance to shipowners.

By invitation of Mr. Edward Beresford, a considerable company assembled at the Temple Pier yesterday week to receive an explanation of the invention and to witness a demonstration of its utility by the Engineer, Mr. Alexander Murray. Among those present were several gentlemen interested in shipping; publicly distinguished among them being Admiral the Hon. Sir Edmund Fremantle and Lieutenant Shackleton. The company were received by Lord Louth and Mr. Beresford. The instrument was fitted on the barge "Renown," of 180 tons capacity, the property of Messrs. William Cory and Son, Limited. The construction of the parts of the instrument, and its fundamental principles were quickly appreciated by those present, through the explicit explanations of Mr. Murray. But the demonstrations of its utility were somewhat spoilt by an oversight. The boat was moored against the pier pontoon by taut cables; and though a large number of the company went on board, the instrument obviously failed to accurately register the weight of the living freight. But when the barge was liberated from its stays, and was free to move in the water, the weight of only one man was approximately indicated by the instrument, though the weight was comparatively infinitesimal compared with the weight of the barge and its carrying capacity. Criticisms of the instrument of a conjectural nature might be made; but there would be little value in them without witnessing demonstrations, under varied conditions, of a more practical nature than that afforded at Temple Pier yesterday week. If the efficiency of the apparatus is proved to be of the high order claimed, the next progressive step should be to fit to it some self-recording arrangement. It is to be hoped that the ingenuity and simplicity of the instrument will receive the reward of a thoroughly proved utility, and then a speedy adoption is bound to follow.

The Editor of the "American Gaslight Journal" recently had a visit from Mr. Thomas Newbigging—"the Hon. Thomas Newbigging, of Manchester, the greatest of all living gas men," as they style him. The Editor says "the well-loved veteran was as nimble of stride, hearty of grip, resonant of voice, and beaming of demeanour, as though not more than fifty years had been his portion in the allotment of days that are done. His visit to America, too, was strictly in line with work; he having accepted a retainer to counsel with Mr. Pearson, of Toronto, over the best type of holder to be constructed on the great new plant of the Consumers' Gas Company of that city."

The reinforcement of concrete by wire nails, in order to raise its compressive strength far beyond the limits of ordinary mixtures, created considerable interest at the recent convention of the American Society for Testing Materials. According to "Engineering Record," the method was employed by the Department of Bridges of the City of New York for filling spaces in some important bridge pedestals, and the tests made before the adoption of the material were described by Mr. Leon S. Moisseiff. He stated very clearly his position regarding the use of this material; pointing out that its cost is prohibitive in ordinary cases, but may be warranted under exceptional circumstances, as in the case of the filling for the bridge pedestals above mentioned. He pointed out, too, that in cases where column footings are to be raised or a foundation has settled, concrete reinforced in this manner might be advantageous. The highest stress developed in the tests was 17,800 lbs. per square inch; the specimen being a 6-inch cube, 15 months old. This value is apparently not accidental, for the companion cube of the same age and size gave a strength of 16,650 lbs. per square inch, while some 12-inch cubes did not fail at the maximum limit of the testing-machine, at which limit they were under a load of 15,300 lbs. per square inch.

FIFTY YEARS OF AMERICAN GAS JOURNALISM.

For some months past, intimations have been given by the conductors of our contemporary the "American Gaslight Journal" of their intention to mark the occurrence of its jubilee on July 1 by the issue of a special number, which it was claimed would "exceed in value any other special number of a technical paper heretofore published, in its special applicability to the industry directly concerned." The number, the literary portion of which occupies 138 quarto pages, is now to hand; and the following is an outline of its contents:

The first page is appropriately occupied with the commencement of an interesting account, written by Mr. T. J. Cunningham, of the foundation of the paper by Messrs. John B. Murray and Co., Bankers, of Wall Street, New York. It was originally intended to be a price current of the gas shares of a few of the principal cities, prepared for gratuitous distribution monthly to the correspondents and dealers of the proprietors. While the sheet was in preparation, however, they were solicited to enlarge the sphere of their plans by embracing all the American Gas Companies, and giving such details as would enable parties interested to compare notes, and avail themselves of every means of improvement, economy, and profit. The request was acceded to, and a sheet of four pages was the result. It was the first paper ever published in America identified with the important interest of gas lighting. Though the responsible Editor was Mr. J. B. Murray, much of the literary work fell upon Dr. John Tarrey and Professor Henry Wurtz. On July 2, 1860, the paper appeared for the first time as a semi-monthly publication (the 1st and 15th of the month); the size being 16 pages. At the end of the year, the editorship passed into the hands of Mr. C. Elton Buck, a young man of considerable scientific attainments, under whose direction its tone was much improved. On Jan. 1, 1863, Messrs. Murray and Co.'s name no longer appeared as proprietors; both the business and editorial direction of the paper having been concentrated in Mr. Buck. On July 1, 1864, the name was changed to the "American Gaslight Journal and Mining Reporter," the Editor and Proprietor being Mr. James W. Bryant and the Consulting Chemist Mr. Buck. Towards the end of the same year, Mr. Mills L. Callender became connected with the paper; and on July 2, 1866, it was published by Messrs. Bryant, Callender, and Co. The death of Mr. Bryant early in 1868 resulted in it being taken over by Mr. Callender, and its title changed to the "American Gaslight Journal." Professor Wurtz edited a department under the head of "Chemical Repertory." In January, 1870, the late Mr. Charles E. Sanderson entered the service of Messrs. Callender and Co. Professor Wurtz severed his connection with the paper in September, 1875, and Major George Warren Dresser took the editorship. By the following year the size had increased to 24 pages. An important event occurred with the issue of the 35th volume (July 2, 1881), when the name of Mr. Charles E. Sanderson appeared officially as Manager—a position he had filled since a few months after Mr. Callender's death. In the summer of 1882, Major Dresser died, and was succeeded by Colonel J. R. Thomas, the Chief Engineer of the Williamsburgh Gas Company of Brooklyn (N.Y.). In 1884, the services of Mr. Norton H. Humphrys were secured as Special English Correspondent; his first letter appearing in the issue for the 2nd of April. The size of the paper was now, on an average, 32 pages; and on Jan. 7, 1889, it appeared for the first time as a weekly publication—Mr. T. J. Cunningham being appointed Editorial Assistant to Colonel Thomas. In November, 1896, the death of Colonel Thomas was announced; and the editorship then devolved upon Mr. Cunningham and Mr. Elbert P. Callender (a son of the late Mr. Mills L. Callender), who still share the duties. In 1897, the size of the paper was increased, and it now averages 48 pages. On Feb. 20, 1907, Mr. Sanderson died; and at the beginning of the present year Mr. Charles H. Wadelton was appointed Manager. This chapter, especially the latter portion of it, covers a critical period in the history of the gas industry, as it deals with its condition during the war, with the controversy over water gas, the introduction of the electric light and the coming to the front of Mr. T. A. Edison, the discovery of the Welsbach burner, and the more extended use of gas for other than lighting purposes.

These historical particulars are followed by a sketch, by Mr. Arthur E. Boardman, of the work of four of the pioneers in bringing about what may be called the fraternity of gas engineers and managers—viz., Major Dresser, Colonel Thomas, Captain W. H. White, and Mr. G. A. M'Ilhenny. This sketch is appropriately followed by a chapter by Mr. George G. Ramsdell, on the influence of the work of Gas Associations on the gas industry. The formation of the New England Association in 1871 initiated the movement. Two years later, the American Gaslight Association came into existence; and others sprang up in course of time—the latest comer being the Pennsylvania State Gas Association, organized in the spring of the present year. No better man could have been selected for dealing with the progress of gas manufacture in New York City during the past fifty years, which is the subject of the next chapter, than Dr. A. H. Elliott, the Chemist-in-Chief of the Consolidated Gas Company. The interest of the author's text is heightened by the curious views of the Manhattan Gas-Works by which it is illustrated. Equally interesting is the account given by Mr. H. Thurston Owens of the progress of street

lighting in New York, which must have involved considerable research, especially the chronology which forms an appendix to the chapter. Going away from New York, Mr. John A. Britton, the Secretary and Treasurer of the Pacific Coast Gas Association, supplies some historical notes on the development of the gas business in that part of the American Continent; Mr. W. M'Kay does the same for Boston (Mass.); Mr. W. H. Pearson for Canada; and Mr. Norton H. Humphrys for Great Britain.

Some interesting and instructive chapters deal with manufacturing operations. Mr. Frederic Egner (whose portrait is given) describes the various processes he has known; Mr. James D. Perkins offers some observations on the gas coals of America; Mr. F. N. Morton gives a half-century's history of water gas; Mr. F. Bredel deals with the application of gaseous fuel to the heating of gas-retorts during the same period; and Mr. F. J. Mayer describes systems of vertical retorts. Mr. Morton's chapter is a valuable one, not only for the matter contained in it, but also for its exceedingly interesting collection of illustrations (57 in all), showing types of plant from Ibbetson's in 1824 to those of Dellwik-Fleischer, Strache, and Kramer and Aarts. Mr. Bredel has also brought together and fully illustrated a great deal of information in regard to a subject on which he is an acknowledged authority; and his chronological table forms a useful appendix to his communication. Mr. Mayer's chapter consists of observations on the Dessau, Bueb, Settle-Padfield, and Woodall-Duckham systems of vertical retorts; the Bueb system being dealt with at the greatest length. Mr. Carroll Miller discourses in a general way on residuals obtained in the manufacture of gas by various processes; and Mr. R. W. Hilgenstock deals with the development of the ammonia industry in gas-works during the past half century.

The rest of the chapters are on subjects bearing upon distribution and the commercial side of the gas industry. Mr. D. M'Donald has something to say on meters and meter makers; Mr. George W. Whyte shows how the manufacture of pipes has developed; Mr. E. P. Reichhelm has a short chapter on heating-machines; and Mr. W. H. Gartley deals with present-day photometrical practice. Dr. C. J. Russell Humphreys supplies a chapter on the development of the Public Utilities Commissions as applied to the gas and electric business; an address on the subject of these Commissions delivered by Mr. Rufus C. Dawes at the banquet of the Illinois Gas Association early in the year is reproduced; progress in the development of electric current in the field of artificial lighting is reviewed by Mr. A. F. Ganz; the value of demonstration work in the household is emphasized by Mrs. Helen Armstrong; and the extent to which the new business division of the gas industry has developed in the period under consideration is shown by Mr. Philmer Eves. A collection of historical productions such as those here briefly noticed would hardly be complete without some personal reminiscences; and these are furnished by Mr. J. B. Howard, the President of the Galena (Ill.) Gas Company, who was associated with gas affairs as long ago as 1844.

In closing this notice of our contemporary's jubilee number, it must be acknowledged that it justifies to a large extent the claim made for it. It is an interesting review of the progress of the gas industry in the period covered, and presents in compact form a good deal of information on the outstanding features of that progress. Those who are responsible for its production may fairly be congratulated upon the success of their effort.

Tests of Filter Sands.

The degree of purification attained by different grades of sand in slow sand filters has been investigated by Mr. A. Robin, the bacteriologist of the Wilmington (Dela.) Water Department, who gives some notes regarding the results in his annual report for 1907-8. The tests lasted about 3½ months, and were made on two experimental filters containing sands which had previously been used in other filtration plants. One bed consisted of sand having an effective size of 0·30 mm., 60 per cent. finer than 0·47 mm., and a uniformity coefficient of 1·51. The sand in the other bed had an effective size of 0·25 mm., 60 per cent. finer than 0·76 mm., and a uniformity coefficient of 3·04. In order that the two units might operate under identical conditions, they were supplied with water from a common source, and fed at a rate of 4 million gallons per acre daily with raw water developing 754 bacteria per cubic centimetre on plain agar, 72 bacteria on bile salt agar, and having a turbidity of 11·7. A higher degree of purification was obtained with the filter containing the sand of the smaller effective size; the percentage of bacterial removal being in one case 98·5 and in the other 97·7. The turbidity of the effluent from the sand with an effective size of 0·25 mm. was 0·4, compared with 1·3 for the sand of 0·30 mm. effective size; thus giving efficiencies for the removal of turbidity from the water of 96·7 and 88·9 per cent. respectively.

The Royal Sanitary Institute have appointed Professor Henry Adams, M.Inst.C.E., Dr. Louis C. Parkes, Professor W. Napier Shaw, D.Sc., and Mr. A. Saxon Snell, F.R.I.B.A., as the adjudicators for the next Henry Saxon Snell prize competition; the subject set being "The Principles of Heating and Ventilating Public Buildings." The essays have to be delivered at the Institute, 90, Buckingham Palace Road, by the 31st of August.

QUALITY OF LONDON GAS.

The results of testings made in the official testing-places controlled by the London County Council of the gas supplied by the three Metropolitan Companies, may be summarized for the second quarter of the year in continuation of the summaries of earlier results which have been given from time to time in the "Journal." The figures refer to the thirteen weeks ending June 26, 1909, and for 1907 and 1908 to the thirteen weeks ending on the corresponding Saturday of the year—viz., June 29, 1907, and June 27, 1908.

In regard to the illuminating power, the average results for the second quarter of the three years for the three Companies are set side by side for convenience of comparison in Table I. These figures refer to the statutory or "penalty" testings made with the "Metropolitan" argand burner No. 2. The corresponding figures for the testings made, for information only, with the flat-flame burner are given in Table II. The prescribed flat-flame burner in the years 1908 and 1909 is Bray's "$\frac{G}{L}$ 5 feet $\frac{15}{10}$" burner, and in 1907 it was Bray's "No. 7 Economizer," fitted over a Bray's "No. 4 regulator." The maximum figures are of comparatively little importance; but it may be noted that on one occasion in 1909 the Gaslight and Coke Company's supply showed as high a value as 18·79 candles with the argand, while the highest figure for the South Metropolitan Company's gas during the same quarter was 18·21 candles, and for the Commercial Gas Company's gas 17·82 candles. The maximum flat-flame values for the same quarter were 13·88 for the Gaslight and Coke Company, 12·90 for the South Metropolitan Company, and 11·38 for the Commercial Company. Having regard to the fact that a forfeiture is incurred if the illuminating power of the gas as shown by the argand burner falls below a certain limit, the minimum figures for the quarter for the three years may be of interest. They are given in Table III. On the other hand, the lowest flat-flame results for this quarter in 1909 were 7·60 for the Gaslight Company, 8·90 for the South Metropolitan Company, and 9·72 for the Commercial Company.

The prominent feature of the results shown in the tables is that the gas supplied by the South Metropolitan Company, which, according to their statutory obligations, need only have an illuminating power of 14 candles, shows in fact an illuminating power by the statutory argand test which is practically identical with that of the gas supplied by the Gaslight and Coke Company, which is still required to be of 16-candle power. It is apparent that the South Metropolitan Company have hitherto failed to take advantage of this liberty to supply a lower candle power gas. Probably this is due to the fact that they have not yet succeeded in finding means of producing by an economically efficient process coal gas of lower average candle power than about 16½ candles. Further, it may be noted that the Commercial Company are only now, by aid of their water-gas plant, beginning to supply gas which is on the average above the statutory requirement of 14 candles by only an ordinary working margin. Since 1907, they have seen their way to reduce the candle power of the supply by nearly a candle. When the Gaslight and Coke Company have obtained the Royal Assent to their new Act, they likewise will be able to reduce the candle power of their gas to approximately the same figure as that to which the Commercial Company are now working, and, having regard to their manufacturing plant, will doubtless do so by the same means—viz., by the incorporation of comparatively feebly-illuminating water gas with the coal gas.

Whether the South Metropolitan Company will ultimately be forced, in order to gain the full advantage of their 14-candle power standard, to adopt the same means of diluting coal gas as the other two Companies, remains to be seen; but unless it can be shown that it is as economical to manufacture coal gas of 16½-candle illuminating power as a mixed gas of 14¾ candles, it is clear that the South Metropolitan Company are not taking full advantage of their statutory powers. The only alternative to the employment of water-gas plant on their works appears to be the discovery and adoption of a process of producing coal gas averaging only 14¾-candle power in place of the present gas of 16½-candle power. Obviously such a process would not be technically economical unless the make of gas obtained per ton of coal carbonized were increased in correspondence with the reduction in illuminating power.

The results of the flat-flame testings are of little importance; but they disclose some curious relations between the gas supplies of the three Companies, and of each of those supplies in different years. Whether these relations have any material basis, or whether they are merely due to erratic observations, is a point on which different opinions will be held. It is a matter of common remark that it is more difficult for two different observers, or for the same observer at different times, to obtain concordant results in making testings with the flat-flame burner than with the argand. But it might be anticipated that any such discrepancies as would thus appear in individual testings would be wiped out in the average results of a whole quarter. Whatever may be the reason, it is worth pointing out that the coal gas of the South Metropolitan Gas Company, which on the average is only 0·2 candle lower in illuminating power, according to the argand test, than the mixed gas of the Gaslight and Coke

TABLE I.—*Testings of Illuminating Power (Argand Burner).*

Average Results for Second Quarter.

—		1907.	1908.	1909.
Gaslight and Coke Company .	candles	16·6	16·92	16·75
South Metropolitan Company .	,,	16·5	16·54	16·64
Commercial Company . . .	,,	15·72	15·19	14·90

TABLE II.—*Testings of Illuminating Power (Flat-Flame Burner).*

Average Results for Second Quarter.

—		1907.	1908.	1909.
Gaslight and Coke Company .	candles	11·6	12·30	11·69
South Metropolitan Company .	,,	11·0	11·34	11·03
Commercial Company . . .	,,	9·68	9·24	9·24

TABLE III.—*Testings of Illuminating Power (Argand Burner).*

Minimum Results for Second Quarter.

—		1907.	1908.	1909.
Gaslight and Coke Company .	. candles	15·08	15·91	15·37
South Metropolitan Company .	,,	14·5	14·51	14·81
Commercial Company. . . .	,,	14·1	14 03	13·55

TABLE IV.—*Testings of Calorific Power.*

Average Results (Calories per Cubic Foot) for Second Quarter.

—	1907.	1908.	1909.	
	Net.	Net.	Net.	Gross.
Gaslight and Coke Company . . .	131·4	131·4	130·0	145·3
South Metropolitan Company . . .	133·4	132·6	132·8	149·7
Commercial Company	128·5	127·3	126·0	140·9

TABLE V.—*Testings of Calorific Power.*

Minimum Results (Calories per Cubic Foot) for Second Quarter.

—	1907.	1908.	1909.	
	Net.	Net.	Net.	Gross.
Gaslight and Coke Company . . .	120·0	121·0	117·5	132 2
South Metropolitan Company . . .	120·9	121·6	124·8	139·6
Commercial Company	116·4	114·6	115 2	130·0

TABLE VI.—*Testings of Sulphur (Grains per* 100 *Cubic Feet of Gas).*

Second Quarter.

Company.	1907.		
	Aver.	Max.	Min.
Gaslight and Coke	42·6	80·0	11·7
South Metropolitan	48·2	97·2	25·8
Commercial	33·85	61·1	18·5
Company.	**1908.**		
	Aver.	Max.	Min.
Gaslight and Coke	43·2	71·2	14·7
South Metropolitan	49·3	85·0	19·0
Commercial	28·76	57·2	17·4
Company.	**1909.**		
	Aver.	Max.	Min.
Gaslight and Coke	35·7	58·8	10·5
South Metropolitan	46·2	107·3	24·2
Commercial	35·8	72·2	1·4

Company, is about 0·5 candle lower according to the flat-flame tests. The lower candle power gas of the Commercial Company naturally shows the greatest difference between the flat-flame and the argand results; but the difference, curiously enough, appears to be diminished as the illuminating power is progressively lowered in course of time. There is, on the average, a difference of approximately 1½ candles between the illuminating power according to the argand test of the gas supplied by the Gaslight and Coke Company and that supplied by the Commercial Company. The difference increases to approximately 2½ candles when the average results of the flat-flame testings are compared. Whether there is any real significance in these figures, is more than doubtful; and in any case neither the argand nor the flat-flame testings have now any real practical value, though the Companies are still tied by the obsolete provisions of their Acts to compliance with certain standards based on the results obtained with the standard argand burner.

The testings of calorific power—which so far have only been carried out for the purpose of information, but from Jan. 1 next will, in the case of the Gaslight and Coke Company, acquire greater significance, on account of the penalty provision of the Company's new Act—may be summarized in the same way as the results of the illuminating power testings. The average results for the second quarter of the last three years are shown in Table IV. The figures for the gross calorific power, which is the true measure of the heating capacity of the gas, were not reported for the years 1907 and 1908 in the weekly returns issued by the London County Council, and so cannot be included in the table. The minimum results for the same quarter of the three years are given in Table V. It will be seen that the Commercial Company's supply, which is required to have an illuminating power of 14 candles, has not on any occasion in these three quarters fallen below the value of 112½ calories net per cubic foot, which is the limit in value above which the Gaslight and Coke Company will have to maintain their supply of 14-candle gas after the close of this year. But the figures show that the margin is none too great, and that this limit in value will be quite high enough to prove irksome to the officers in charge of the manufacturing stations of the Company.

In regard to the average figures, the coal gas supplied by the South Metropolitan Company, with a nominal 14-candle standard illuminating power, is 2 calories per cubic foot higher in net calorific power than the mixed gas supplied by the Gaslight and Coke Company under their 16-candle standard of illuminating power. The mixed gas supplied by the Commercial Company, which has the same standard illuminating power as the supply of the South Metropolitan Company, is, on the average, about 5½ calories lower than the coal gas of the latter Company and 3½ calories lower than the mixed gas of the Gaslight and Coke Company. It may therefore be anticipated that, when the latter Company's supply is reduced after the close of this year from 16 to 14 nominal candle power, the falling off in calorific power will be only about 3½ calories—that is to say, the calorific power, for a reduction of 2 candles in the nominal illuminating power of the gas, will be reduced by only 2¾ per cent. Bearing in mind also that calorific power is not the sole criterion of the value of a gas for lighting by means of incandescent mantles, but that the flame temperature or the nature of the constituents of the gas is at least as important as calorific power *per se*, it may be concluded that, for all practical purposes, the consumer will receive a supply as suitable to his requirements under the 14-candle standard as under the 16-candle standard of illuminating power. Whether the standard of illuminating power, if retained at all, may not with advantage be brought still lower (say, to 10 or 12 candles) is a point well worthy of consideration. In regard to it, the results of the flat-flame testings of illuminating power supply some information. The lowest flat-flame result in the second quarter of the three years is 7·6 candles.

Reference to the investigations reported in the last two numbers of the "JOURNAL"—viz., those by Dr. Ott, of the Zürich Gas-Works, on the results of carbonization in different types of retort (*ante*, p. 186), and those on the carbonization of German coals at the German Association's Experimental Works at Carlsruhe (*ante*, p. 238)—will show that the illuminating power of coal gas tested in a flat-flame burner may be dropped to even 3 candles without such a fall in calorific power taking place as would bring the gas below the penalty limit to which the Gaslight and Coke Company have just assented. What the drop from 7·6 to 3 candles or thereabouts in the results of flat-flame testings represents in the illuminating power of the gas as tested in the standard argand burner cannot be stated definitely; but it may be that with coal gas, if not also with mixed gas, an illuminating power in the standard argand burner of 12 candles would correspond with an average calorific power of at least 112½ calories, or 450 B.Th.U. net per cubic foot. A supply of gas of this quality should fulfil all reasonable requirements; but in order to meet the exigencies of manufacturing operations, it would be necessary that any catch-penalty limit which might be fixed upon should be below the 106 calories per cubic foot, which the Gaslight and Coke Company have reluctantly accepted in their new Act.

The results of the testings of the amount of sulphur in the gas supplied by the three Companies during the second quarter of the year are shown in Table VI. for the last three years. In regard to these figures, the most remarkable feature is the substantial drop in 1909 in the amount of sulphur in the gas supplied by the Gaslight and Coke Company. It now averages only 35·7 grains, which is practically the same as the average during the same quarter of this year for the supply of the Commercial Gas Company. The maximum result is also commendably low—viz., 58·8 grains per 100 cubic feet. There is comparatively little change in the amount of sulphur in the gas supplied by the South Metropolitan Company, and it may be concluded that there is no reasonably practicable process of reducing the amount of sulphur in coal gas, other than by the use of sulphided lime, below the average of about 48 grains per 100 cubic feet. This figure, of course, applies only to coal gas made from coals such as those the Company ordinarily carbonize. It may be that the changes in methods of carbonization which are now being extensively made, especially in Continental gas works, will result in a reduction in the amount of sulphur in coal gas. Apart from this, it would seem that the only practicable means of reducing the amount of sulphur in a gas supply is by mixing a substantial proportion of water gas with the coal gas, as is done by the Gaslight and Coke and Commercial Companies. Whether this advantage outweighs certain well-known disadvantages of such admixture is a matter for serious consideration by administrators of our various gas undertakings.

Mr. Alfred Richards, of Gordon Square, W.C., and of Finsbury Circus, E.C., auctioneer, who died on the 17th of June, aged 51, left estate of the gross value of £64,389, of which the net personalty has been sworn at £50,171.

THE NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting at Stirling.

[From Our Own Correspondent.]

The North British Association of Gas Managers held their Forty-Eighth Annual Meeting at Stirling on Thursday last, under the Presidency of Mr. J. D. Smith, of Stirling. Other two years, and the Association will celebrate its jubilee. When this time arrives, there will be no one left in the membership who joined the ranks at the formation of the Association. The last of the original members retired at this time, in the resignation of Mr. A. Bell, sen., late of Dalkeith, whose short but pathetic letter was read to the meeting. It was a graceful act on the part of the meeting, on the suggestion of the President, to place Mr. Bell among the honorary members—an honour he well deserves, on account of his personal merits, as well as his long connection with the gas industry and the Association. Perhaps in no other Association of Gas Managers in the United Kingdom have the links with the past been more completely severed than has been the case with the North British. The dominant members of the Association of only a few years ago are all gone, and younger men have taken their place. The Association, it is a satisfaction to note, has not suffered by the change. The old leaders have disappeared; but new ones have taken their place, and the work of the Association is being carried on as vigorously as ever—probably with somewhat more vigour than formerly, due to the exuberance of minds fresh to office. The gathering at Stirling was a very large one. There were apprehensions that the business would be protracted; but so well had the arrangements been made, and so admirable were the tact and judgment of the President, that all the business was overtaken, and everything disposed of in perfect harmony, at an earlier hour than usual.

A year ago—presumably under the feeling that now the Association has been affiliated with the Institution of Gas Engineers, and that there was consequently necessity, or at least advisability, in the Association conforming more to Institution practices—it was remitted to the Committee to consider the rules and regulations of the Association. The outcome of the remit was the submission by the Committee of an entirely new set of rules and regulations of a much more extensive and detailed nature than those in existence. The Committee, when put to it to apply their mind to the subject, considered the desirability of taking powers to make the Association more an organized body in the interests of the gas industry than it has been; and their proposal was acceded to. This is a step of some importance, as it will enable the Committee, or as it is now designated the Council, to act in the name of the Association in questions which have, or may be regarded as having, a general bearing upon gas matters. Following the adoption of this new attitude, it would seem to be incumbent on the Association, if the Council are to act with authority in any question which may arise, that there should be a movement at once for an extensive ingathering into the Association of gas managers who have not yet seen it to be their interest to join. That there is room for such a movement is evident. There are over 250 gas undertakings in Scotland; and there are only, according to the President, 171 managers enrolled in the Association. Probably the Secretary of the Association—Mr. L. Hislop, of Uddingston—who takes such a deep interest in the welfare of the Association, will give this subject his consideration. It was probably with the view of conforming to the ways of the Gas Institution that the Committee put forward proposals which were intended to place a restriction upon the admission to, not to say the exclusion from, the Association of the commercial element. The extent to which the meeting went in this matter was to adopt a rule under which only principals and managers of commercial undertakings doing business with the gas industry will be admitted to the position of extraordinary members. The commercial traveller, if he has no other qualification, is to be debarred from membership. Probably as effective a bar as direct exclusion is to be found in a new provision as to subscriptions, which imposes an entrance fee of £5 upon extraordinary members. Applications for extraordinary membership will probably be fewer than they have been; and thus, through the operation of both enactments, the commercial element will probably be restricted to a somewhat select class.

The President delivered a most thoughtful Inaugural Address, for which he was deservedly thanked. The technical matter before the meeting was not of a distinguished nature—containing nothing new except in matters of detail; but it was of interest to the members, as showing them what their neighbours and colleagues are doing. In the report of the Committee, it was recommended that, on account of the cost which would be involved in the publication of the papers of the late Mr. William Young, the proposal should be relinquished. This was agreed to; but a new proposal was appropriately made by Mr. J. W. Napier, of Alloa, for the commemoration of Mr. Young's name by means of a prize to be offered to students in "Gas Manufacture." The proposal—which, it is to be hoped, will be found more feasible than the publication of Mr. Young's papers—was remitted to the Committee to deal with. It will consequently receive kindly consideration; and it is quite likely that, following it up, some means will be found for the commemoration of so distinguished a gas specialist.

The Forty-Eighth Annual Meeting of the Association was held in the Albert Hall, Stirling, last Thursday. There was an exceedingly good attendance.

The President (Mr. J. D. Smith, of Stirling), on taking the chair, expressed pleasure at seeing such a large turn-out of members. The meeting, he said, had been called for an early hour, so that they might devote as much time as possible to the important business before them. They had letters of apology from Mr. J. W. Helps, the President of the Institution of Gas Engineers, Mr. Thomas Glover, the Past-President, Mr. W. R. Herring, and a number of their members, who found it inconvenient to be present.

Report of the Committee.

The President said the first business before the meeting was the report of the Committee. If it was agreeable to them, they would take it as read; and he had much pleasure in moving its adoption. There were two items in the report the discussion of which would be left over until after the President's Address—viz., the proposed new rules and secretarial work.

Mr. W. Wilson (Falkirk) seconded; and the motion was adopted.

The report was as follows:

The forty-seventh annual general meeting of the Association, under the presidency of Mr. W. Blair, of Helensburgh, was held in Edinburgh on July 23. Mr. Blair has been appointed delegate to represent the Association on the Council of the Institution of Gas Engineers for the year 1909-10.

During the past year the Benevolent Fund has not been drawn upon. The Research Fund has been drawn upon to the extent of £31 10s. (contribution to the Livesey Memorial Fund).

It has been the constant endeavour of the Committee to carry on the business of the Association on economical yet efficient lines; and it is pleasing to record that the finances of the Association have never been in a more flourishing condition.

A testimonial, generously subscribed to by the members of the Association and friends, was presented to Mrs. Carlow, widow of the late Secretary and Treasurer, Mr. R. S. Carlow, by Mr. J. D. Smith, President, in the name of the Association. The testimonial was graciously received and fittingly acknowledged by Mrs. Carlow.

During the past year, an Eastern Commercial Section was formed under the auspices of the Waverley Association. The North-Eastern and Western Sections still continue in operation. It is to be hoped the interest in the Commercial Sections will not wane. The thanks of the Association are due to the Secretaries of the various sections.

During the past year, your Committee have devoted a considerable amount of time to the consideration of the publication in book form of the papers and contributions to the various Technical Societies and Technical Press by the late Mr. William Young. The President and the Secretary of the Association had several interviews with Mr. J. Gordon Mason, S.S.C., of Edinburgh (Agent for Mr. William Young's Executors), and also with Dr. Daniell, of London, and Mr. Walter King, of the "Journal of Gas Lighting," and a considerable amount of correspondence passed between the Committee and Mr. Mason. A bibliographical index of Mr. Young's contributions to technology was prepared by Dr. Daniell, and an approximate estimate of the cost of publication was obtained, which, it was found, would amount to over £600. As there was no prospect of the publication ever being a financial success, the Committee unanimously agreed to relinquish the idea of publication. The best thanks of the Association are due to Dr. Daniell and Mr. Walter King for the amount of valuable time and consideration which they gave to this matter.

The Statistical Report has been revised and retained as a feature of the published proceedings, in accordance with the wishes of the Association.

In accordance with the remit from the last annual general meeting of the Association, the rules of the Association have been revised and augmented, and a new set prepared for the consideration of the members. The Committee have given much time to the compilation and

preparation of these rules, and unanimously propose, and have confidence in recommending, their adoption.

Your Committee consider that the time has now arrived for the appointment of a permanent Secretary and Treasurer to carry on the secretarial work of the Association; and an opportunity will be given at the ensuing annual meeting for the members to express their opinion as to whether or not the Secretary should be a member of the Association.

The Committee desire to refer to the great loss sustained by the gas engineering profession in the death of the late Sir George Livesey. Mr. J. D. Smith and Mr. L. Hislop were delegated to represent the Association at the funeral.

Your Committee recommend that the following gentlemen be admitted as members:—

Associate Members.—Thomas Orr, Motherwell; Lawrence Kerr, Leven, Fife.

Ordinary Members.—James Bell, Kirkintilloch; James Brown, Larkhall; Watson M. Cowie, Lockerbie; Samuel Dickie, Dumfries; Thomas Lindsay, Gourock; James Purves, Ayr; Henry S. Ritchie, Fraserburgh; John M. Smith, Dumfries.

Extraordinary Members.—Peter Blair, Birmingham; James Brown, Glasgow; R. M. Cairns, Glasgow; Ralph Emmerson, Glasgow; James Fraser, Glasgow; Walter B. Hudson, Manchester; Thomas Jordan, Manchester; Chas. W. Kraushaar, Manchester; Frederick H. Lamb, Manchester; J. B. Macdermott, Glasgow; Hugh J. Miller, Glasgow; George Mills, Edinburgh; Andrew Taylor, Glasgow; Horace M. Thornton, London; Bertram B. Waller, Stroud; James D. Whitelaw, Glasgow; H. James Yates, Birmingham.

The President, in moving that the proposed new members and associates be admitted, said they regretted to see some of their ordinary members resigning; but it was gratifying to find so many additions to their ranks. Their total membership last year was 248; this year it would be 268.

Commemoration of the Late Mr. William Young.

Mr. J. W. Napier (Alloa) said that, arising out of the report, there was a matter which, because of its importance, ought not to be lost sight of. He referred to the question of the commemoration of the late Mr. William Young. The Committee, he understood, had carried out their best endeavours towards formulating a practical scheme for publishing the contributions of Mr. Young. Unfortunately, this scheme must be marked out as somewhat impossible, because of its financial aspect. He would like to congratulate the Committee on the large amount of work which they had done in attempting to carry out the scheme, which, he might say, in certain aspects, would have been a very desirable one, and one which, he was sure, would have met the wishes of Mr. Young's warmest admirers. But he was not certain that the publication of Mr. Young's papers would have been the best way to commemorate such a distinguished individual. It had been said that the technical books in their Universities were old after ten years; and he was just afraid that, while Mr. Young was the pioneer in his conception, and in his theory of things, the book could only be looked upon as a memorial volume, and hardly as a standard work of reference. He had gone into the matter carefully, and in his own mind had formulated a conception as to what the North British Association should endeavour to do by way of keeping green the memory of Mr. Young. They must always remember that there was only one William Young, and his work was not provincial. It was work of a kind which appealed to Great Britain, and also to a wider audience. But he thought it was a duty, nevertheless, of the North British Association to take the initiative in determining what would be a satisfactory memorial. It was not his intention to discuss the form the memorial ought to take, but rather to suggest that a Special Committee be appointed in order to deal with the matter. His feeling was that a capital sum should be raised by subscription, the interest of which would be devoted to the creation, or formation, of what would ultimately be known as the William Young Memorial Prize. This prize would be given to the best student in gas manufacture throughout Great Britain presenting himself at the annual Technological Examinations. This aspect of such a memorial had several desirable features. It would be an encouragement to their young men. He thought any young man who could gain, by his own efforts, such a reward as the William Young prize, would be able to forward his own interests, and at the same time he would earn for himself considerable merit. There would also be the other satisfactory feature that, compared with the giving of a medal by their Association, or any other Association, the award would be in perfectly independent hands. He moved that a Special Committee be elected, comprising the President, the Vice-President, Mr. S. Milne, Mr. A. Yuill, and Mr. W. B. M'Lusky, to consider the matter.

Mr. A. Waddell (Dunfermline) seconded.

The President suggested that it might be as well to remit the matter to the Committee of the Association, with power to add to their number. He moved to this effect.

Mr. S. Milne (Aberdeen) seconded; and this motion was carried by a large majority.

The Auditor's Report.

Mr. R. B. Main (Glasgow) submitted the Auditor's report for the past year; and, in doing so, he said he had again to congratulate the Association on the satisfactory financial position in which they stood. The increases on the various funds were: General Fund, £19; and Benevolent Fund, £43. From the Research Fund, as they had already heard, a sum of £31 10s. had been contributed to the Livesey Memorial Fund. There was an increase in the Research Fund; and but for this contribution, the increase would have been £72. Of course, it was a very exceptional payment, which probably would not occur again for a long time; but even after paying this £31 10s., there was an increase of £41. The funds stood at: General Fund, £41; Benevolent Fund, £452; Research Fund, £145; and Excursion Fund, £36. The total funds amounted to £675. He had great pleasure in hearing testimony to the clear way in which the Secretary had put the accounts before him. Not a single correction had been made; and he thought that altogether the Association might congratulate themselves on the present position of affairs.

The President moved the adoption of the accounts and the Auditor's report. It was, he remarked, satisfactory to see that they were getting into such a good financial position.

Mr. D. Robertson (Dunoon) seconded; and the motion was agreed to.

Presentation to Mr. Main.

The President, in proposing a vote of thanks to Mr. Main for the labour and trouble he had taken in going over their accounts, said they were all aware that this gentleman had asked to be relieved of duty. The Committee could only accept his resignation with regret. He had much pleasure in asking him to accept the barometer they saw before them, as a small token of their goodwill. It was impossible for the Association to adequately recompense Mr. Main for his past labours; but they trusted that this gift would remind him of his official connection with the Association. He would ask them to place Mr. Main's name on their list of honorary members. He had served the Association as Auditor for about twenty years.

The proposal was unanimously adopted.

Mr. Main thanked the President for the kind manner in which he had spoken of his past services to the Association, and the members for the hearty manner in which they had responded. They had conferred upon him a very high honour in electing him an honorary member of the Association. He had also to thank them for the handsome gift. His reason for resigning the position of Auditor was not because of the work. The work had always been a pleasure to him; but he had felt for some time that the funds of the Association had been growing to such an extent that the time had arrived when an accountant should fill the position. But for the unfortunate illness of their Secretary, Mr. Carlow, he would have resigned some time ago.

A Letter from Mr. A. Bell, Sen.

The Secretary (Mr. L. Hislop, of Uddingston) read the following letter from Mr. A. Bell, sen., late of Dalkeith:

I regret to say that, in consequence of bad health, I have been compelled to drop out of the ranks of our profession. I must, therefore, in accordance with our rules, resign my membership of the North British Association. I was present at its inception, and an original member; and I now wish it long life and prosperity. Should any friends care to inquire, please say my health is much improved.

The President moved that they also make Mr. Bell an honorary member. He had been connected with the Association since the start; and therefore he was quite worthy of having his name added to the list of honorary members.

Mr. A. Waddell (Dunfermline) seconded; and the proposal was cordially agreed to.

PRESIDENTIAL ADDRESS.

The President then delivered his inaugural address, which was as follows.

Gentlemen,—In taking the chair on this occasion, it is impossible for me to allow the opportunity to pass without cordially thanking you for the high honour you conferred upon me in electing me your President. I appreciate that honour more highly than I can express; while at the same time I am deeply conscious of my inability to competently discharge the important duties which necessarily devolve upon me. In a word, permit me to say that I shall perform those duties to the best of my ability, and confidently rely upon your generous sympathy and co-operation for the rest. With such assistance, I feel sure our annual meeting will not be less successful than the many brilliant gatherings which have preceded it.

I feel it my duty to refer to the loss the gas industry at large has sustained by the death of Sir George Livesey. As you are all aware, a fund has been raised for the purpose of endowing a Chair of Gas Engineering and Fuel in Leeds University, as a memorial to the late chief of the gas profession. The endowed professorship should greatly benefit all young men who are privileged to take the course of instruction specially adapted to the needs of the gas industry; and I feel confident you will approve the action of your Committee in granting the sum of thirty guineas from the funds of the Association towards this object.

CARBONIZATION METHODS.

Although it is quite true that the various methods and processes involved in our business of gas manufacture and supply were never at a more interesting stage of improvement and development than is now the case, I hope you will bear with me if I content myself by directing your attention in the direction of carbonization methods, as being the most live of the many live

questions of interest to us at the moment. During the past few years, many departures have been made from the old methods of carbonization in horizontal retorts; and we are now confronted with quite a number of recognized improved methods as carried out in the vertical retorts, inclined retorts, and chamber settings. Gas engineers who in the near future contemplate extending or reconstructing their carbonizing plant are brought face to face with a very difficult problem in deciding which form of carbonizing plant to adopt. While every gas engineer welcomes any fresh information regarding improved plant, still the questions of relative comparisons of working results, capital costs, and working expenses of the various systems are so misleading and unsatisfactory as to make the selection of any one system very difficult to decide upon.

Were it possible to test all the various systems of carbonizing plant in any one locality using the same coal, the difficulty of making comparisons would be greatly minimized; whereas, as a matter of fact, the various new systems of carbonizing plant are situated in different localities, using different coal, and working under different local conditions. It is, therefore, quite apparent that any comparisons made would be misleading. We are, however, greatly indebted to those engineers who have done so much pioneer work to improve the carbonizing plant and bring it to such a state of perfection as to render the success of the vertical retort, inclined retort, and chamber settings assured.

Although we recognize and appreciate the advancement made in the carbonizing plant of late, it must be borne in mind that very few of us have facilities at our disposal for taking advantage of the improvements which these plants effect. For instance, existing retort-houses and retort-benches have to be worked out, and, in some cases, expensive stoking machinery. Under the latter conditions, it devolves upon us to endeavour to work our existing plant to the best possible advantage, until such time as we are enabled to avail ourselves of the improved arrangements. It may have occurred to many of you that a considerable amount of information has been acquired in connection with carbonization from the results obtained in the various new systems, which can be beneficially applied in the working of ordinary horizontal retorts. I refer specially to the system of heavy charging, which has undoubtedly many advantages. It may be of interest here if I give you a brief account of a system which I adopted in Stirling about eighteen months ago, and which proved to be a very profitable one.*

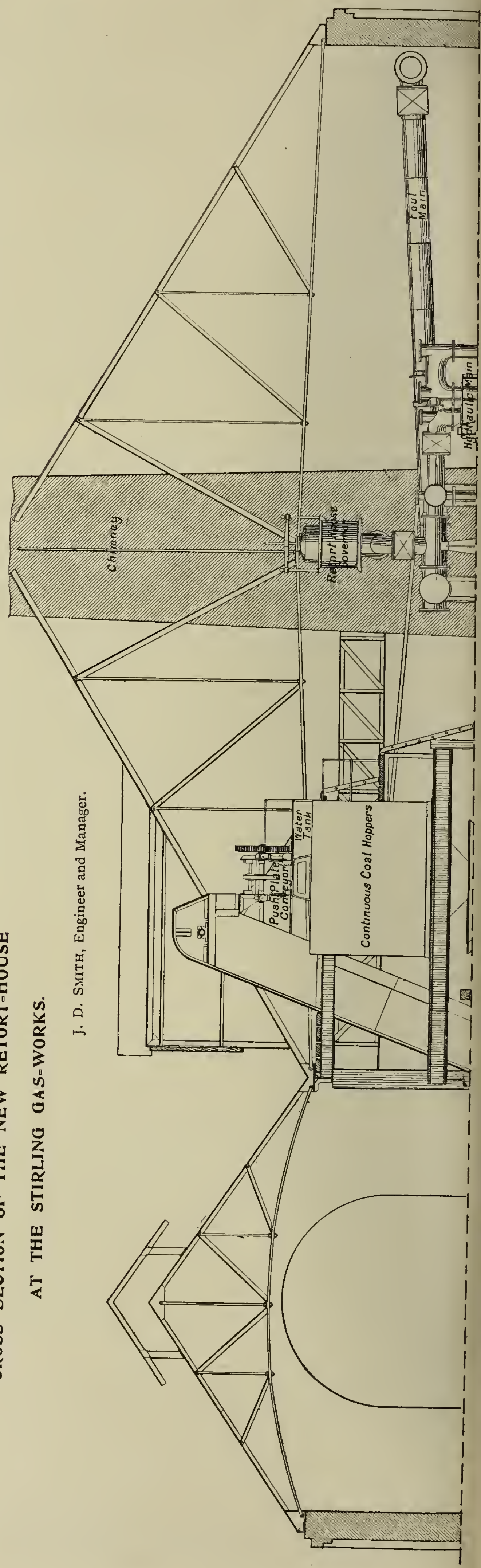
THE CARBONIZING PLANT AT STIRLING.

The latest carbonizing plant at Stirling, as most of you are aware, consists of five through ovens of eight retorts, charged and discharged by means of electrically driven stoking machinery. The retorts are 20 feet long, 22 inches by 16 inches in cross section; each oven being heated by one internal producer at the discharge side of the ovens. The ascension pipes are fixed at the discharge side of the retorts only, and are 8 inches in diameter.

A reference to the accompanying illustrations will show that the hydraulic main is of an improved type, and possesses many valuable features. The main is divided into sections; and each oven has a separate section which can be worked independently of any other. Tar-pipes are fitted to each section of the main, and are connected up to a tar-tower at the end of the retort-house. A special feature of the hydraulic main is the continuous open seal, the entire length of each section, which is sufficiently wide to permit of cleaning-out operations without in any way interfering with the make of gas. The open seal is fitted with light, loose covers, to prevent dirt and dust from getting into the main. The many advantages of the open seal will be quickly appreciated. For instance, in the event of a choked dip or bridge pipe, it is the usual custom for workmen to auger the obstructing material into the main, with the result that the tar-pipes are probably choked. There is also the great objection of allowing any thick tarry matter to remain in the hydraulic to obstruct the flow of the gas through the seal of the dip-pipes. These and other objections to the closed hydraulic main are obviated. The bottom of the main is sloped, and the tar-pipe at the bottom of each section is always open when that section is in use. This ensures that all tarry matter is displaced from the main, and the dip-pipes sealed in liquor. The seal of the dip-pipes is regulated at the tar-tower only.

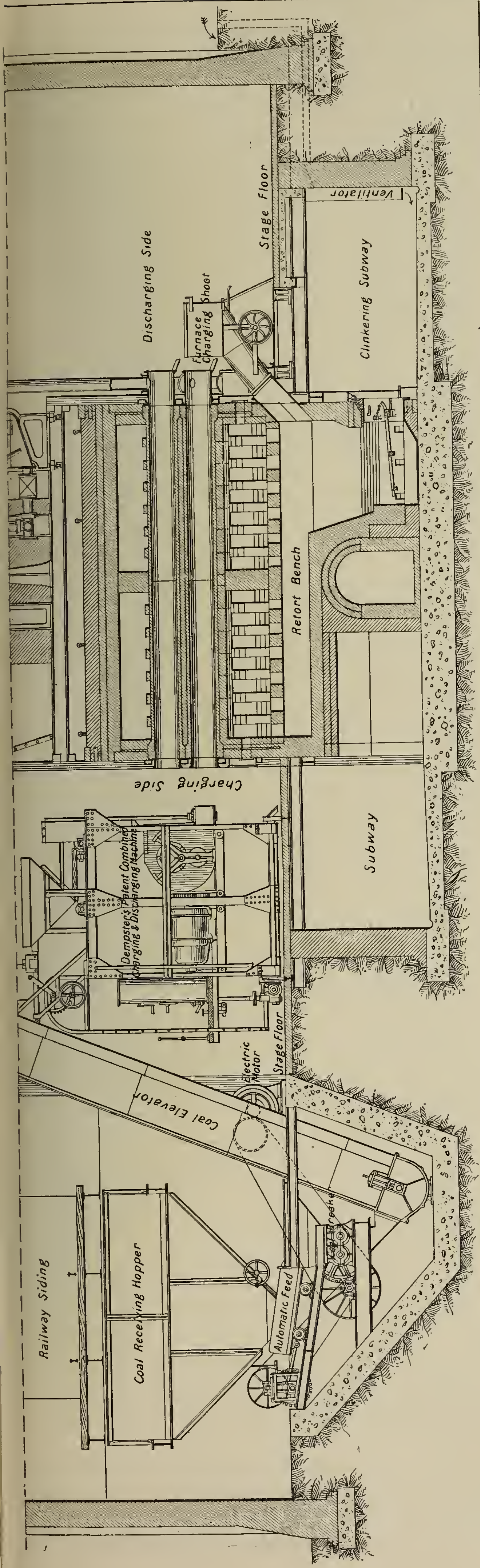
The open seal also enables the depth of the seal of the dip-pipes to be checked frequently with a minimum of trouble; and the level of the entire main can be checked in a few minutes by the aid of a graduated dipping-rod. The dip-pipes are sealed ½-inch in the liquor of the hydraulic main; the mouths of the dip-pipes being turned to almost a knife-edge, in order to lessen the friction and resistance to the flow of gas when passing through the seal. A Cowan retort-house governor is fitted on the foul main, close to the hydraulic main, which enables the seal of the dip-pipes to be reduced to a minimum, owing to the steady action of the governor. The governor is adjusted to maintain a draw or vacuum in the hydraulic main from 1-10th to level gauge; and I find it works admirably under that range.

It occurs to me that the advantages of the retort-house governor are not sufficiently well known, or not credited by many gas managers; otherwise many more of these governors would be installed in gas-works throughout Scotland. It may be the opinion of many that these governors are only adaptable to large or medium-sized works; but I see no reason why they should not be a success in the smallest works, where an exhauster is in use.



CROSS SECTION OF THE NEW RETORT-HOUSE AT THE STIRLING GAS-WORKS.

J. D. SMITH, Engineer and Manager.



It is my humble impression that no piece of gas manufacturing apparatus has done more in recent years to improve carbonizing results than the retort-house governor. In fact, I look upon the governor as being a safety valve, as overdrawing by the exhauster is entirely prevented. This advantage is in itself surely a boon to the gas manager's peace of mind—not taking into account the fact that an increase of 500 cubic feet of gas per ton of coal may be obtained by the proper use of this piece of plant.

The stoking machine was made by Messrs. R. Dempster and Sons, of Elland, on Toogood's patent. This machine has been fully described in the Technical Press on previous occasions.* I might, however, say that it has given us every satisfaction, and more than realized our anticipations. With this machine, we can rely on obtaining perfectly level charges, and it is a machine which, if we desire it, will enable us to completely fill the retorts —being well adapted for this purpose. The machine is supplied with coal from overhead bunkers, which are filled by means of an elevator and overhead conveyor from our coal-stores.

SYSTEM OF CARBONIZING AT STIRLING.

Having given you a brief description of the Stirling carbonizing plant, I shall now endeavour to describe the system of carbonization which I find most profitable. At the outset, I may state the system consists in charging heavy, and allowing the charge sufficient time to burn completely off with moderate heats. Coking coal only is used, and the weight of each charge is from 8 to 9 cwt. The heats are regulated to burn off this weight of coal in six hours. During last winter, by working on this method, the retorts were capable of making about 17,000 cubic feet of gas per retort per diem. The advantages of this method of heavy charging are many. In the first place, a substantial increase in the make of gas per ton of coal is obtained, as is also an increase of from one to two candles in illuminating power; the coke is of a very superior quality; and the tar is comparatively thin and oily. Another advantage is the largely increased yield of ammonia; this increase amounting to about 25 per cent. Stopped ascension pipes and naphthalene troubles are practically *nil;* and the operation of scurfing retorts is reduced to a minimum.

The working results obtained for the year ending May 15 last may be of interest to you, as the method just described was strictly adhered to during the whole year. The figures are given below. In passing, I may mention that the coke sold per ton of coal is screened coke only, and does not include breeze—all the latter being consumed in the works' boilers. Since the end of our last financial year (May 15), I have been experimenting on eight-hour charges, increasing the weight of the charges from 9 to 10 cwt. The results obtained up to the 12th inst. are appended.

	Year to May 15, 1909.		May 16 to July 12, 1909.
Coal carbonized, tons	12,225	..	1113·2
Gas made, cubic feet	135,323,000	..	13,122,000
Benzol used, gallons	9190	..	1247
Benzol used, gallons per ton of coal carbonized	0·75	..	1·11
Coke sold, tons	6226	..	578
Coke sold, cwt. per ton of coal carbonized	10·18	..	10·38
Tar sold, gallons	110,798	..	10,796
Tar sold, gallons per ton of coal carbonized	9·06	..	9·69
Sulphate of ammonia sold, tons	146	..	16
Sulphate of ammonia sold, pounds per ton of coal carbonized	26·75	..	32·19
Illuminating power supplied, candles	20	..	20

In looking over the carbonizing figures for six-hour and eight-hour-charges, it must be admitted that the carbonizing capabilities of the horizontal retort are not yet exhausted; and, therefore, further experiments with the horizontals may lead to results equal to those obtained in the new forms of carbonizing plant.

ILLUMINATING AND CALORIFIC POWER TESTS.

Dealing with the illuminating power and calorific value tests, I have no doubt that every Scottish gas engineer will welcome and appreciate the proposal of the Council of the Institution of Gas Engineers, in conjunction with the Gas Companies' Protection Association, to promote a Bill in Parliament for making the No. 2 "Metropolitan" burner the test burner. Should the promoters of the Bill be successful in getting it passed, the advantages of such a Bill would be beneficially felt in Scotland. Only nine gas-works in Scotland supply gas under 20-candle power. I have compiled the following table showing the illuminating power supplied by almost all the gas-works in Scotland:—

Candle Power Supplied.		Number of Works.	Candle Power Supplied.		Number of Works.
16	..	2	24	..	48
17	..	2	25	..	45
18	..	2	26	..	15
19	..	3	27	..	13
20	..	24	28	..	11
21	..	11	29	..	2
22	..	34	30	..	7
23	..	16	over 30	..	4

From the table it will be observed that the progress of reducing the illuminating power in Scotland is very slow, considering that the incandescent form of gas lighting is now almost universally adopted. At the present time such a high illuminating power is simply wasteful and extravagant. The union jet test-burner is also a great handicap to many gas undertakings in Scotland; and

* See "JOURNAL," Vol. XCIX. p. 824.

the sooner it is superseded by the No. 2 "Metropolitan" test-burner, the better it will be for all concerned.

The gas industry is indebted to the Gaslight and Coke Company (of London) for the progressive step they have taken in submitting to a calorific value test being included in their recent Act of Parliament.

While we may deprecate the precedent of submitting to the imposition of an additional test for calorific value without being relieved of the illuminating power test, still I have no doubt the recognizing of the calorific test is the first step towards the abolition of the illuminating power test; and if it is necessary that we should have some sort of test, I consider the calorific value one to be the most suitable. In these days of keen competition, I regard the imposition of these tests as a hardship on gas undertakings. It stands to reason that consumers would purchase their light, heat, and power where they got the best value for their money; and, therefore, I consider the owners of gas undertakings would make it their business to supply gas to their consumers of such a quality as to give them the best satisfaction, without being compelled by Act of Parliament to supply gas of a stipulated quality.

PROPOSED REVISION OF THE ASSOCIATION RULES.

Gentlemen, I now wish to allude to another matter. The subject I desire to introduce is, to us, as an Association representing the great gas industry in Scotland, one of supreme and vital importance. I refer to the proposed revisal of the rules and regulations, as recommended by the Committee at the last annual meeting of the Association. When the Committee made this important recommendation, and asked the members for power to proceed with the work, they fully realized the difficulty and delicacy of their self-imposed task; but having the future success of the Parent Gas Association at heart, and realizing the position into which the affairs of the Association had drifted, the Committee, with commendable spirit, immediately turned their attention to the business of reorganization—determined to overcome all difficulties and prejudices in their endeavour to secure for the Association a rejuvenated constitution.

The Committee entrusted with the work of revisal have now completed their task. They have devoted much time and thought to the new rules; and the result of their labours is a most excellent production—worthy of general approval. A careful perusal of the rules will convince us that the Committee have produced a work which should stand for years to come, a most efficient guide to the Association, its Committee of Management, and its salaried officials. Assuming that you have all carefully perused the new rules, and noted wherein they differ from the old, I shall not trouble you with a lengthy statement; instead, I will make a few simple observations just as we proceed. As a preface, it is well to remember the fact that the Committee have incorporated in the new rules all the characteristics of the old ones; indeed, so much care has been exercised in the retention of these old characteristics, that it might well be said that the new rules are simply an elaboration of the old ones to suit the altered conditions of the times. The Committee have also kept in view the fact that the old rules were not sufficiently comprehensive and expansive. It is common knowledge that the old rules of our Association were not on a level with the rules of other Associations of equal importance; and, as a consequence, our Association suffered by comparison. Under the old rules, the object of the Association was limited in the extreme; and its Committee of Management was powerless to act in times of emergency. Under the new rules, however, the object of the Association, though clearly defined, is nevertheless almost unlimited; and the Committee, having the power, may act promptly at all times in the name of the Association. The duties and powers of the Committee, or, as we prefer to call it, the Council, the Secretary and Treasurer, and the Auditor, as well as the mode of procedure at general and other meetings, are now more fully and clearly defined, and much good is expected to follow the change.

A careful perusal of the new object of the Association reveals a great potentiality for good lying dormant and ready to hand; and it is hoped that, in years to come, this instrument, in the hands of a wise Council, will play no mean part in furthering the interests of the gas industry generally. Some time ago we were all on the *qui vive* regarding the Railway Companies' new demurrage charges. Unfortunately, under the old rules, the Committee were powerless to act on behalf of the Scottish gas industry. Under the new rules, however, the Council could, if considered necessary, take whatever action they thought best for the general good. There are other ways in which the Association, through its Council, could help gas concerns; and I may mention one by way of example. Supposing a gas company intended to contest a legal point, or to apply for a Parliamentary, Board of Trade, or other concession, and found it necessary to obtain the support of the Scottish gas profession in the prosecution of their case, the Secretary, with the concurrence of the manager of such a company, could communicate with the officials in charge of the Association, and in due course a meeting of the Council could be held to consider the gas company's communication. If, in the Council's opinion, the point at issue was one which, whether gained or lost, would materially assist the gas industry, then the Council could, without cost to the Association, inform and assure the contending gas company of the moral support of the members of the Association.

The rules forming the constitution, and those relative to the contributions of members to the funds, call for no comment; but rules 15 and 18 (relative to the privileges of membership and the admission of visitors to meetings) may be noted. Rule 15 is a very desirable one, and permits the Association officials to remit the payment of the annual subscription and all arrears, if any, to any member who, for causes specified, may be unable to pay his contributions to the funds of the Association. Rule 18 makes it impossible for any person, excepting members and visitors invited by the President, to attend meetings of the Association. The Committee felt that there has been too much of the unassociated commercial element at our meetings, and that the interests of the extraordinary members were not sufficiently protected. I am afraid the only course left open to commercial gentlemen, if they would like to attend our meetings, is to become enrolled as extraordinary members.

According to rule 23, honorary members may now be admitted by a two-thirds majority; under the old rules a unanimous vote was necessary.

We now come to the section dealing with the election of councillors. You will observe there are considerable changes in this section. The first change of note is to be found in rule 30. It is stated that two councillors shall retire annually; according to the old rules three members retired annually. The difference is, that members of Council will now sit for three years, as compared with two years formerly. In reviewing this change, it should be noted that in future the Secretary and Treasurer will not be a member of Council, and will have no vote in the affairs of the Council. The old and new rules both agree that a retiring councillor shall be ineligible for re-election during the following year. In order to maintain the Committee always at its maximum strength, rule 37 has been drafted to enable the Council to deal with a vacancy promptly. This is a wise precaution, and the point need not be elaborated. Under this rule, the Council have also power to temporarily fill up a vacancy in the presidency between any two annual general meetings. Rule 31 permits a President or Vice-President to remain in office for two years consecutively; but this is a prerogative the Council would only exercise upon very special occasions, and under exceptional circumstances. This rule further stipulates that a retiring President is ineligible for re-election to any office for a period of two years. It will be noticed that in future the salary of the Secretary and Treasurer is to be paid entirely out of the general fund of the Association. This is provided for by rule 34. In the past, the salary was paid in part out of all the funds of the Association.

It is, I think, well known to you that attempts have been made at various times to better the system of electing members to office. Those attempts to alter and improve the old 27th rule clearly indicated that dissatisfaction existed with the present system; and it was only a question of time when a radical change would have to be made. When we consider that our Association has on its roll 171 ordinary members, and only from 40 to 50 take the trouble to return their voting papers, it is proof, we think, that the system in vogue is either wrong, or that the members have lost all personal interest in the affairs of the Association. We are of opinion that both are at fault; but there must surely be a remedy. The remedy, we believe, will be found in the adoption of a system which will always ensure a vote being recorded by every member attending the annual meeting. Such a system is proposed in rule 35; and, if adopted, it would broaden the basis of representation, and secure that interest in the affairs of the Association which has many years been lacking. Rule 35 has been carefully drafted. The Committee are strongly of opinion that it is a proper substitute for the old one.

The powers proposed to be delegated to the Council are plainly specified in rules 38 to 46; and the duty of appointing a Revisal Committee falls to be performed by the Council under rule 42, section (*f*). Rule 44 is a new rule, and everybody will admit a very proper one. The duties of the Secretary and Treasurer are fully sketched in rules 47 and 48, and prohibit this official having a vote in the affairs of the Council.

The necessity for the proposal now before you is very real. Because the old constitution of the Association has appeared for so long to be sufficient for all purposes and for all times, it is not proof that we do not now require to remodel our constitution, and otherwise put our house in order. Just as the times have changed, so also have we changed, and so also must our institutions change if progress be aimed at. It is our desire, therefore, that the Association should be brought into line with the times; for only by such a step can we hope to retain our place worthily among the other healthy and progressive institutions of the gas industry. If it is also your desire to see the Association progressive, and, at times aggressive, if need be, then you must provide the Association with the means of modern existence, and the machinery to drive it. In all ages, and at all times, in affairs of State, as well as in the simpler affairs of everyday business and social life, it has often been found necessary to ring-down the curtain upon old and familiar, though decadent, scenes, that it may be again raised to display new scenes better fitted to the times, and modern in form as well as in spirit. Such changes are inevitable, and not even our Association can escape.

Mr. A. WADDELL proposed a vote of thanks to the President for his able, lucid, and interesting address. What the President had given them in the matter of his retorting was, in itself, a very simple way of gaining his object. They saw, from the figures, a great deal was gained by simply charging the retorts much fuller than they had been doing in the past. This, he believed, a great

many people were prepared to consider nowadays. He thought it had gone beyond question, and had become a practical fact. The President had also given them a clear description of the rules as they were now proposed to be put before them; and there, again, no doubt his views would meet with the hearty approval of the whole of the members. Any discussion which might arise on a few points relating to the rules was just what the President and the Committee expected; the whole Association ought to congratulate themselves upon the bringing forward of the proposed new rules.

The PRESIDENT thanked Mr. Waddell and the members for the vote.

Discussion on Rules.

A discussion next took place on a series of rules and regulations which were laid before the meeting by the Committee.

The PRESIDENT said he had dealt largely with these rules in his address; and he did not think there was anything else he could say in connection with them, and he moved approval of the new rules.

Mr. A. YUILL (Dundee) observed that the rules proposed that the appointment of the Secretary should be left entirely in the hands of the Council. He knew it was a debatable point with some members whether they ought to have the Secretary outside the Association. He felt strongly that they ought to have a Secretary from among their own number. They had plenty of young men who were able and willing to serve them. It should be clear and well defined whom the Council should have the right to appoint. If they passed the rules as they stood, complete power would go to the Council. The rule to this effect should not be adopted as proposed.

It was agreed to take up the rules *seriatim*. Most of them were adopted as proposed, and some with modifications.

Mr. J. W. NAPIER called attention to the proposal to give power to the Council to invest the funds of the Association in, among other things, companies; and, after discussion, it was agreed that moneys should only be invested in trust securities.

Upon the section headed "Constitution," Mr. ALEX. WILSON (Glasgow) said it was proposed that extraordinary members should consist of "gentlemen either actively engaged in the pursuit of business, or directly associated, or interested in, companies, firms, or concerns doing business with gas-works." He thought that the rule was too wide. He spoke for a good many; and it seemed to be also the President's opinion that there bad been too much of the commercial element attending their meetings in the past. He would propose that extraordinary members should consist of "gentlemen who, as principals of firms," &c. If they only admitted principals, they would really get the best of the gentlemen who were connected with trade to attend their meetings, and would keep out those to whom personally he had no objection, but who had led to trouble in the past. He thought the trouble could best be avoided at a time like this, when they were considering new rules. He would not interfere with those who were already extraordinary members, but would have the rule passed for future guidance.

Mr. YUILL supported Mr. Wilson's proposal so far; but he pointed out that in large trusts the principal was sometimes only a figurehead. He suggested that the words should be "as principals or managers."

Mr. WILSON had no objection to the words being added; and the clause, as amended, was agreed to.

Clauses were agreed to proposing that subscriptions should be graded according to the make of gas. Members whose annual manufacture did not exceed 10 million cubic feet to pay 7s. 6d.; members between 10 and 20 million cubic feet, 10s.; and members above 20 million cubic feet, 12s. 6d. Extraordinary members to pay £5 on election and 12s. 6d. yearly. In all these cases, a proportion of the subscription, amounting to 2s. 6d., to be applied to the Benevolent Fund, and the balance to the General Fund. Associate members to pay 5s. to the General Fund.

The new rules proposed that the Secretary should "not necessarily" be a member of the Association.

Mr. YUILL moved that the words "not necessarily" be deleted.

Mr. M'LUSKY seconded; and the motion was agreed to.

After the clauses had been gone over *seriatim*,

The PRESIDENT formally moved the adoption of the rules as amended.

Mr. YUILL seconded; and the rules were unanimously adopted.

Election of Office-Bearers.

As the result of the ballot, the following were elected office-bearers for the year:—

President.—Mr. A. Waddell, of Dunfermline.

Vice-Presidents.—Mr. George Keiller, of Broughty Ferry; and Mr. S. Milne, of Aberdeen.

Secretary and Treasurer.—Mr. L. Hislop, of Uddingston.

Auditor.—Mr. D. Spalding, C.A., of Glasgow.

Members of Committee.—Mr. D. Vass, of Airdrie; Mr. J. B. Scott, of Cowdenbeath; and Mr. R. Simpson, of Cambuslang.

Place of Next Meeting.

It was decided that the meeting next year should be held in Dunfermline.

Reading of Papers.

The reading of papers was then proceeded with. These were: "The Installation of Carburetted Water Gas at Aberdeen," by Mr. S. Milne—see p. 316; "The Working Efficiency of High-Pressure Gas Plant at Dunfermline," by Mr. Alex. Waddell—see p. 325; and "The Latest Practical and Horizontal Retort-Settings at Falkirk," by Mr. W. Wilson—see p. 321.

Closing Proceedings.

Mr. W. BLAIR (Helensburgh), as Past-President, presented the President's Medal to Mr. Smith, who briefly returned thanks for the decoration.

Mr. D. VASS proposed a vote of thanks to the readers of papers, which was heartily accorded.

Mr. A. MACKAY (Montrose) proposed a vote of thanks to the Scrutineers, which was also heartily accorded.

Mr. D. ROBERTSON (Dunoon) proposed a vote of thanks to the Secretary, which Mr. HISLOP acknowledged.

Later, a company of ladies and gentlemen numbering nearly 150 dined together in the Golden Lion Hotel, under the presidency of Mr. J. D. Smith, who was supported by several of his Directors. The toast of "The North British Association" was felicitously proposed by Mr. R. G. Shadbolt, of Grantham, and acknowledged by the President. Mr. D. Macfie, of Edinburgh, proposed "Our Guests," which was acknowledged by Mr. Fleming, a Director of the Stirling Gas Company. Mr. W. Doig Gibb, of Newcastle, in response to calls from the company, expressed his sense of the honour which had been conferred upon him by their asking him to speak, and his pleasure at being present on this occasion in fulfilment of a promise made to Mr. Smith, one of his oldest friends, ten months ago.

In the evening, a reception and dance were given, in the Golden Lion Hotel, by the Directors of the Stirling Gas Company. The company was a large and brilliant one. The guests were received by ex-Provost Kinross, Mr. W. Rodgers, and Sir J. B. Smith, Directors of the Company. Dancing was kept up till about one o'clock in the morning.

On Friday, a party of about a hundred ladies and gentlemen had an excursion by motor *char-a-bancs* to Callander, going by Dunblane, Crieff, Comrie, St. Fillans, and Locbearnhead. Dinner was served in the Dreadnought Hotel at Callander—Mr. Smith in the chair. A number of toasts were pledged. The party returned *via* Doune; Stirling being reached in the evening in time to allow most of the members to get home that night. The excursion took place in dull, but, on the whole, not unfavourable weather.

Subways in the City of London.—According to the report of Mr. Frank Sumner, M.Inst.C.E., the City Engineer, on the works executed by the Public Health Department of the Corporation during the twelve months ended Dec. 31, 1908, there were in use at the close of the year 1 mile 947 yards of subways, which contained about 2 miles 693 yards of gas-mains and 1 mile 1638 yards of water-mains; the length of mains and conduits of various kinds in the subways under the control of the Public Health Department being about 13 miles 999 yards.

Exhibition of Processes for Making Gas for Balloons.—The last number of the weekly journal "Ila," which is the official organ of the International Aëronautical Exhibition at Frankfort-on-Maine, contained an announcement of a forthcoming exhibition and demonstration of processes for the production of gas for charging balloons. The processes will include those intended for stationary use as well as portable plant and apparatus for refilling balloons during an ascent. The demonstrations will take place at the time of the congress of the Associations of German Chemists and of German Aëronauts—viz., on the 14th prox. and subsequent days; and invitations will be sent to all military authorities and foreign aëronautical societies to witness the proceedings. Gold, silver, and bronze medals will be awarded to the best of the competing processes, by an International Committee of judges whose names will be announced later. Entries should be sent to the Scientific Committee of the Internationale Luftschiffahrt-Austellung at Frankfort.

The Margate Appointment.—At a special meeting of the Directors of the Isle of Thanet Gas Company held last Tuesday, Mr. Frank Higginson, the Engineer, Manager, and Secretary of the Broadstairs Gas Company, was appointed to the position of Engineer and Manager. During the nine years he has been at Broadstairs he has displayed such conspicuous ability, and his relations with his Directors have been of so harmonious a nature, that they are naturally loth to lose his services. They therefore urged him to reconsider his decision, and gave him assurances of so satisfactory a character that, after mature deliberation, he has decided to withdraw his acceptance of the Margate position. Under these circumstances, a fresh selection was rendered necessary; and the choice has fallen upon Mr. J. M. Campbell, who is at present engaged at the Luton Gas-Works. Mr. Campbell acted as Resident Engineer during the erection of a gasholder and tank at Devonport; and he described this work at length before a recent meeting of the London and Southern District Junior Gas Association—see "JOURNAL" for last February and March, pp. 317, 531, 622. Mr. Campbell's connection with the early history of this Association was one that secured for him the gratitude of many juniors in the gas profession.

HEFNER AND HARCOURT LAMPS COMPARED.

A recent number of the "Elektrotechnischen Zeitschrift" contained an article by Herr E. Brodhun, of the Imperial Physical Technical Institute (Reichsanstalt), Charlottenburg, on the relative merits of the Hefner and the ten-candle pentane lamps.

The author first points out that there are now only three of the numerous standards of light which have been proposed from time to time which have an extensive use. These are the old French Carcel lamp, the Hefner lamp, and the ten-candle pentane lamp. The Carcel lamp is still used in France, but it is surpassed by the other two standards in all the more important respects, and will evidently be superseded. The amyl-acetate lamp, as defined by von Hefner-Alteneck in 1884, has already attained very wide application. It has been generally adopted in Germany, and is used in many other countries—particularly since its acceptance by the International Electro-Technical Congress in Vienna in 1896 as the practical standard of light representing the Bougie Décimale, or tenth part of the Violle unit of light. The Harcourt pentane lamp is considerably more recent, having been first prescribed in 1898. It is used more particularly in England, where it has been adopted by the Gas Referees and by the National Physical Laboratory as the official standard of light. In Germany, however, it is so far little known; and on this account the author considers it may be useful to state and compare briefly the advantages and disadvantages of it and the Hefner lamp.

The definition of the Hefner lamp, which is simple and short, is quoted by him; but as it already appears in numerous textbooks, it need not be reproduced. Then follows a brief description of the Harcourt pentane lamp, which it is likewise unnecessary to reproduce. The author goes on to say that, on using the two lamps, a number of advantages of the pentane lamp are at once apparent. The Hefner lamp has a rather red-coloured flame, and its intensity is low; therefore, it must be brought comparatively near to the photometer screen, which entails very exact measurement of the distance between the screen and the flame. The flame is sensitive to draughts; and its height must be set very exactly, as a change of only 1 mm. in the height of the flame causes a change of nearly 3 per cent. in the intensity of the light. On the other hand, the colour of the pentane flame is much whiter—approximately the same as that of a carbon filament lamp. The intensity is about eleven times that of the Hefner flame; so that for the same illumination of the photometer screen, the Harcourt lamp is placed at three times the distance of the Hefner lamp from the screen. The pentane flame is not very sensitive to draught; and its height need not be set with great precision.

Against these readily recognizable faults of the Hefner lamp, may be set several advantages which, according to Herr Brodhun, it possesses in use. For instance, the Hefner lamp is much handier and much more easily set up and put into action than the pentane lamp, which is over six times its height. The latter must be carefully levelled, and, on account of the cutting-off action of the chimney, be set so that the lower edge of the chimney is precisely at the same height as the middle of the photometer disc. Also, the Hefner lamp is, according to the tests of the Reichsanstalt, much less sensitive to vitiation of the air than the pentane lamp, which is a matter of importance having regard to the fact that photometer rooms are frequently small. The illuminating power of the pentane lamp moreover frequently shows considerable and unaccountable fluctuations (as much as 1 per cent.) in similar meteorological conditions in the course of a few hours. The Hefner lamp does not show such fluctuations. The lower price of the Hefner lamp is also an advantage.

The greater or smaller convenience in working must not however, the author continues, be taken as the most important factor in judging a unit of light. On the other hand, it should be ascertained primarily to what extent both lamps fulfil certain requirements with which a good standard of light should comply. The chief requirement is that it is capable at any time of being produced, as conveniently as possible, of exactly the same value. In the case of these two lamps, this entails that the lamps must be readily reproducible, and that the fuel must be capable of manufacture of the same composition always. The first of these two requirements is fulfilled by the Hefner lamp very completely. It is only of importance with it that the prescribed dimensions should be maintained in regard to the German silver wick-tube, of which the thickness of the walls is specially important; and, secondly, that the method adopted for measuring the height of the flame should give that height correctly. The dimensions of the wick-tube may be easily checked, and the height given by the flame measurer can at any time be tested by the gauge which is provided with each lamp. On the other hand, a great number of dimensions have to be observed with the pentane lamp. The effect of deviations from the prescribed measurements has not been established in detail by exact experiments; and the complexity of the lamp would make this investigation a very difficult one. It may be feared that the fine orifices of the burner will be partially blocked in course of time, and that the illuminating power will be thereby altered. These considerations agree with practical experiences.

At the Reichsanstalt, up to the present time, nearly 700 Hefner lamps, with Visier flame-measurers, coming from different works have been tested. In no one of them has a deviation in illuminating power from the standard of the Reichsanstalt been detected when the dimensions were correct. This is not the case with the pentane lamp. Recently the Reichsanstalt was furnished by the National Physical Laboratory with a ten-candle pentane lamp for experimental purposes which it was stated had 0·4 per cent. less illuminating power than the standard of that laboratory. Mr. Paterson of the same laboratory has also reported that, according to his investigations, new pentane lamps have a lower illuminating power than old ones. (See "JOURNAL," Vol. XCIX., p. 223.) He has at times found a difference of 0·75 per cent. between an old and a new lamp. He could not give a reason for the difference, but thought that it might be due to a change in the radiating surfaces of the lamp in course of time.

In regard to the fuel, the Hefner lamp uses amyl-acetate which is a simple, well-defined chemical substance which can be manufactured, without difficulty, of adequate purity. There are simple methods of testing the purity of the amyl-acetate. It may be stored for a long time without change. On the other hand, pentane is not a simple body, but a mixture of different isomers having different boiling points. It has not hitherto been carefully determined what effect a difference in composition of the pentane has on the illuminating power; and this would be difficult to ascertain definitely. This view is supported by a consideration of the prescription given by the Gas Referees for the manufacture of the fuel. It is described as consisting chiefly of pentane, together with small quantities of lower and higher homologues whose presence does not affect the light of the lamp. The last statement appears to require substantiation. The specific gravity of the pentane should lie between certain limits; and if the containing vessel is not tightly closed, or is frequently opened, the more volatile constituents distil off, the specific gravity is raised, and the fuel no longer complies with the prescription. Pentane which was sent from England to the Reichsanstalt for photometric purposes had too high a specific gravity, and consequently did not comply with the prescription, because, notwithstanding that the containing vessel was apparently well sealed, a fraction of the liquor had evaporated.

These considerations, the author says, lead to the conclusion that a constant illuminating power cannot be obtained with the same certainty by means of the ten-candle pentane lamp as by the Hefner lamp. Anyone who has worked with a Hefner lamp knows its faults, and knows that a more convenient standard of light is desirable; but so long as we have only the present standards of light (and choice therefore practically rests between the Hefner lamp and the pentane lamp), there can be no doubt that the Hefner lamp has the advantage, as the pentane lamp is lacking in the most important properties of a good unit of light—viz., ready and certain reproducibility, and a uniform well-defined fuel.

INDICATING OF GAS-ENGINES.

At the Summer Meeting of the Institution of Mechanical Engineers in Liverpool last week, a paper on the above subject was submitted by Professor Burstall, of the University of Birmingham. He pointed out that in the report of the Standards Committee on Gas-Engines of the Institution of Civil Engineers, the opinion was expressed that the indicating of gas-engines was open to very much greater errors than was the case with steam-engines, and that they therefore preferred to draw all their conclusions from the studying of the brake-horse-power. The matter was considered by the Research Committee of the Institution of Mechanical Engineers; and, in order to determine what the error amounted to, it was decided to use two indicators simultaneously—one being the ordinary string type, and the other the optical indicator. The results given in the paper were purely comparisons of indicators, as it was found that after the experiments had been concluded the cylinder of the engine was very badly oval, and a considerable amount of leakage was taking place to the differential piston, which vitiated the results as regards efficiencies. But as the indicator diagrams were all taken simultaneously, the comparison of the indicator was not affected. The engine experimented upon had a cylinder 16 inches in diameter by 24 inches stroke, running at 165 revolutions per minute under full load.

The result of the comparisons, while not furnishing absolute proof of the accuracy of either of the indicators, afforded strong evidence that both were giving results very close to the truth. They are entirely dissimilar types—one multiplying the motion of the indicator piston by 6, and the other by about 120; and a very similar multiplication is the case with the rotation of the drum and the mirror. The two give results to within 3 per cent. of the mean pressure, and very nearly the same figures for the initial pressure; and the author thought this was good presumptive evidence that when either indicator is used with the precautions described in the paper the results obtained are at least as accurate as any other measurement that can be made in engine testing. But he emphasized the point that unless these precautions are taken when obtaining indicator diagrams, the results should only be looked upon as affording a clue to the valve-setting, and not as giving any reliable figures as to the power developed in the engine cylinder.

The Oswestry Gas Company have lately sustained a loss by the death of their Chairman, Mr. William Jackson, who left estate of the value of £14,104.

FIRST INSTALLATION OF DESSAU VERTICAL RETORTS IN THE UNITED STATES.

The current number of "Progressive Age" contains the follow-ng article by Mr. F. J. Mayer, giving a description of the installa-ion of Dessau vertical retorts in course of construction at the ew works of the Providence (R.I.) Gas Company at Sassafras Point. It is based upon particulars furnished by Mr. J. W. Ellis, he President of the Company.

The location furnishes a most favourable site for the new plant, eing easily accessible both for water and rail shipments. Coal vill be delivered almost by water shipments exclusively. The arbonizing plant will consist, for the first unit, of four batteries f six benches, having ten vertical retorts each, all constructed on he Dessau system. Two of the batteries will be installed at once; ut the retort-house will be of sufficient dimensions to contain the our forming the first unit. The entire producing capacity will e 3½ million cubic feet of gas per day.

The coal will be handled to the storage-bins, located in the etort-house immediately above the benches, by machinery of the nost approved and latest design, either from the coal-barges direct r from storage after having passed through suitable crushers ocated in the elevator tower, which latter is placed at a distance f 24 feet from the gable end of the retort-house. The elevator ower is immediately adjacent to the covered storage-shed, and he latter is parallel with the water front. All the coal is charged y gravity—excluding all machinery. Suitable measuring hoppers re provided for the charging of the coal, travelling over the retorts n a longitudinal direction. Additional hoppers run on suspended ails on a centre line between the longitudinal row of retorts, sup-lying breeze to the bottom of the retorts for preventing the charge f coal coming into contact with surfaces of the retorts which are ot exposed directly to the action of the fire.

The hot coke is discharged from the lower end of the retorts hrough a movable shoot into the conveyor, to be transferred to he end of the retort-house, and from there into an automatic kip-hoist, by means of which the coke is elevated and discharged nto the night storage-bin. The final disposition of the coke from his bin is accomplished by means of the telpherage system, by vhich it is transferred to the yard. If rail shipments are desired, he coke is discharged immediately from the bottom of the ele-vated night storage-bin into the railroad cars. For the breeze supply to the bottom of the retorts, as well as for the coke supply o the generator furnaces, there are located in an elevated posi-ion alongside the gable wall nearest the night storage-bin, on the nside of the retort-house, storage-bins of suitable capacity for he purpose intended. For the coke supply to the generator urnaces, suitable hoppers travelling upon a suspended rail im-nediately over the centre of the charging-holes are provided. The coke for the furnaces, as well as the breeze for the retorts, is returned to the retort-house by side dumping-cars elevated upon a platform elevator, located at the end of the retort-house, to the top of the coke and breeze storage bins.

All the coal and coke handling machinery is of the latest type, and so arranged that a minimum of attention is required in its operation. It is actuated by electric power supplied by a direct current of 220 volts.

In the design of the benches, as well as in the remaining por-tion of the plant, the latest details have been incorporated; and therefore the plant should give better results than the best ob-tained in other countries, on account of the character of the Westmoreland coal, which is particularly suitable for carboniza-tion in vertical retorts, as has been demonstrated by tests con-ducted under practical operating conditions. The entire car-bonizing plant, which is shown in the accompanying illustrations, has been designed and is being executed by the Didier-March Company, of New York.

Retort-House.

The retort-house has a width of 80 feet and a length of 215 feet, a height to the eaves of the roof of 31 ft. 6 in., and a centre height to the ridge of the monitor of 65 feet. The total carbonizing capacity of the house, as already stated, is 3½ million cubic feet of gas in 24 hours. In designing it, particular consideration was given to its ventilation and to comfort of the operators. The roof on each side of the centre of the building is divided into two principal sections, the top section being surmounted by an open ridge venti-lator. This arrangement in connection with the stationary louvres contained in the side walls, will effectually prevent any accumu-lation of gases or vapours produced by the quenching of the hot coke. The entire building consists of a steel structure, in which the panels formed by the various members are filled with brick-work, stationary louvres, swinging windows, and sliding doors, as shown on the illustrations.

In a longitudinal direction, the building is divided into fifteen panels, twelve of which are immediately opposite the benches. In the space occupied by the central panels is located the main stair-way, from which access is had to various operating platforms. The stairways and platforms throughout the building are also constructed of steel. The two end panels provide for connec-tion from one side of the house to the other, and also give access to the central portion of the house located between the benches. In one of these end panels (the one nearest the night storage-bin) are the overhead coke and breeze bins already referred to. In each of the panels of the side walls of the build-ing, immediately above the floor line, are located sliding doors made in two halves, which, when opened wide, will greatly assist

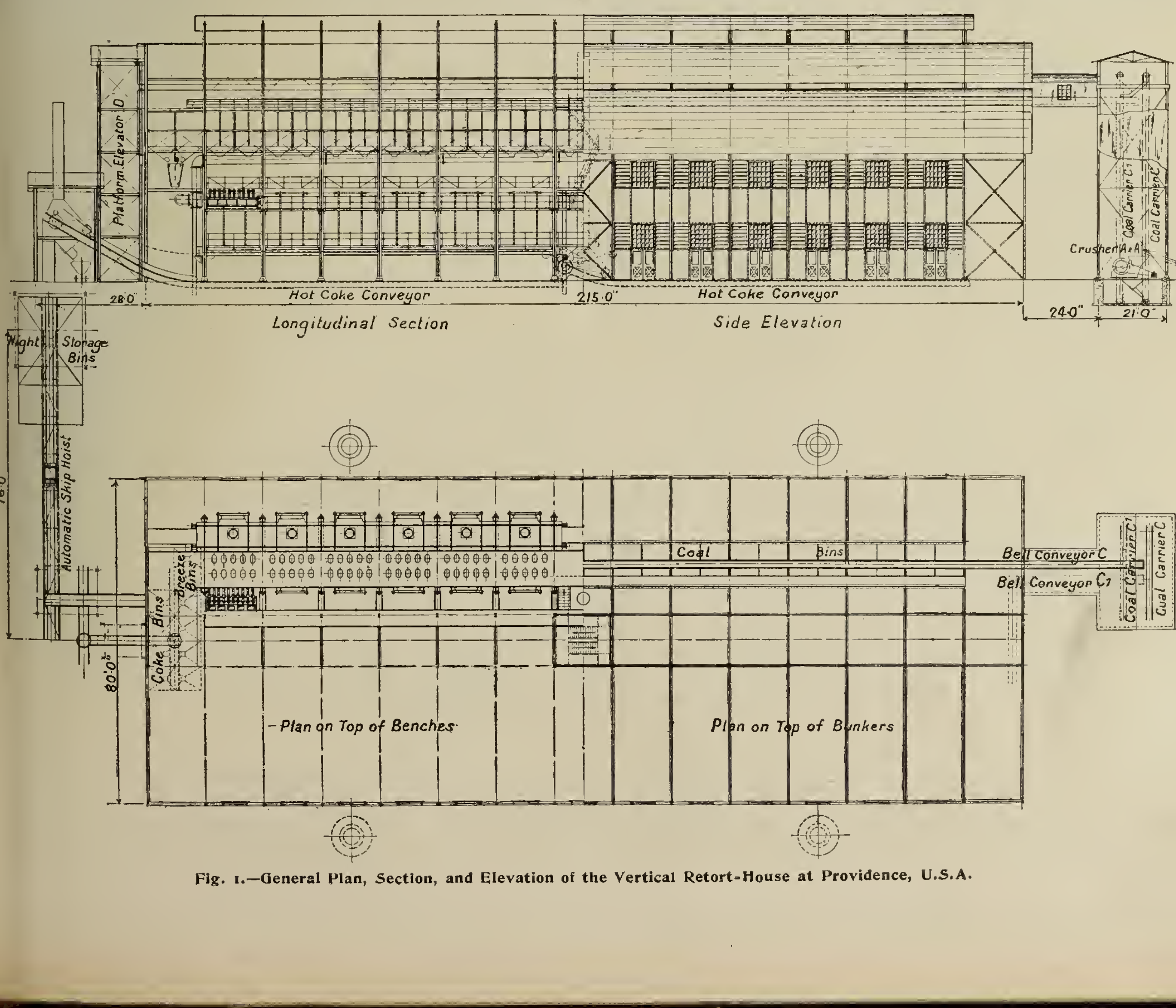


Fig. 1.—General Plan, Section, and Elevation of the Vertical Retort-House at Providence, U.S.A.

in properly ventilating the house during summer. For the support of the central portion of the roof and the coal-bins, which are placed immediately above the benches, the building is supplied with two longitudinal central rows of steel columns, which in a transverse direction coincide with the position of the columns in the side walls of the building. Transverse latticed girders constructed of steel extend from side to side of the building, and are supported by the columns in the centre and the side walls. These girders support the overhead coal-bins, which are located on a centre line of the benches. All the bins are constructed of steel plates, and are continuous, extending from end to end over the two batteries of benches. The storage-bin will be large enough for 36 hours' consumption of coal. With such large capacity, the operation of the coal-handling machinery on Sundays will be entirely avoided. It will further furnish a safeguard against any interruption in the working of the plant resulting from breakdowns of the coal-handling machinery. The bottoms of the coal-bins are inclined, and provided with two discharging valves over each of the benches—thus avoiding all travelling of the charging-hoppers after they have been filled. The coke and breeze bins are also constructed of steel plates, similar to the coal-bins. They are located, as already stated, adjacent to one of the gable walls of the house, and therefore coke-shoots supplying the generator furnaces will have to travel from the storage-bins throughout the entire length of the house. Ample time is available for this purpose, on account of the large capacity of the furnaces.

Retort-Benches.

The retort-benches will be constructed in two batteries. Each battery will consist of six benches, and each bench will contain ten vertical retorts, oblong in cross section, having a length of 13 feet. The charge of coal for each retort will be 1100 lbs., and the carbonizing time 10 hours. The gas produced in each retort in 24 hours will average 14,000 cubic feet, or a total of 140,000 cubic feet per bench. For 24 benches the total capacity will be 3,360,000 cubic feet of straight coal gas. The remainder to make up the capacity of 3,500,000 cubic feet is supplied by the production of water gas during the last two hours of the carbonizing period in each retort.

The benches are constructed upon cast-iron base-plates in an elevated position, supported by steel columns, with the exception of the generator furnace and the recuperation system; the latter starting from the top of the foundation, and extending to the top of the bench. The steel supporting structure of the benches forms also a portion of the longitudinal and transverse anchorage. The tops of the benches are covered with a steel platform, which will extend throughout the entire length of the two batteries of benches. By this arrangement, only one crew is required for the two stacks of benches. The operating platform is protected on both sides by steel rails connected to the platform by a vertical continuous flange to prevent accidents to the men and dropping of pieces of coal and coke over the edge of the platform.

The retorts are placed in two parallel rows, five retorts to the row for each bench. All the retorts are tapering towards the bottom, and the retort-chamber is so arranged that all the products of combustion pass from the chamber, located at the lower end of the retorts, in a zigzag direction to the upper portion of the bench, at which point they enter the smoke flues of the recuperative system. This extends throughout the entire depth of the generator furnace, and is divided in two sections, one on each side of the furnaces. Before the furnace gases pass to the oxide flue of the bench, they are carried round a steam developer to produce steam for the purpose of mixing with the primary air before the latter enters the furnace under the grate-bars. The space occupied by the generator furnaces and the two recuperator systems extends throughout the length of the bench. Carbon monoxide produced in the furnaces is carried to the bottom of the combustion chamber immediately around the lower portion of the retorts, and at this point intimately mixes with the preheated secondary air for the purpose of maintaining a temperature in the lower portion of the combustion chamber of 2600° to 2800° Fahr. The temperature is gradually reduced towards the top of the retorts by means of regulating devices, so that complete carbonization in all parts of the retorts is accomplished in ten hours. The lateral bracing of the retorts is such that deformation cannot occur unless the temperature is raised to such a height that the retort will fuse. The lower portion of the combustion chamber is constructed of isolating material of special design and mixture; and the lower portions of the retorts and settings are made of special materials to resist continuously the effects of the extremely high temperatures above referred to.

The upper and lower mouthpieces are provided with self-sealing lids, tightened and held in position by means of specially designed cotter bars and operating mechanism. The upper lids are operated immediately on top of the bench; the lower lids from the outside by a system of levers, racks, pinions, and chain gearing, so arranged that either of the mouthpieces can be engaged and disengaged with the mechanism from a position common to all mouthpieces for one bench. The clinkering-doors of the furnaces are located immediately above the retort-house floor, and are provided with self-sealing lids and special openings, through which are inserted the temporary water-cooled grate-bars while clinkering. Clinkering is necessary every 36 to 48 hours, depending on the character of the coal and coke.

The steel operating platform on top of the benches is fixed sufficiently high above the brickwork to admit of placing underneath the platform the gas take-off pipes, which are attached to

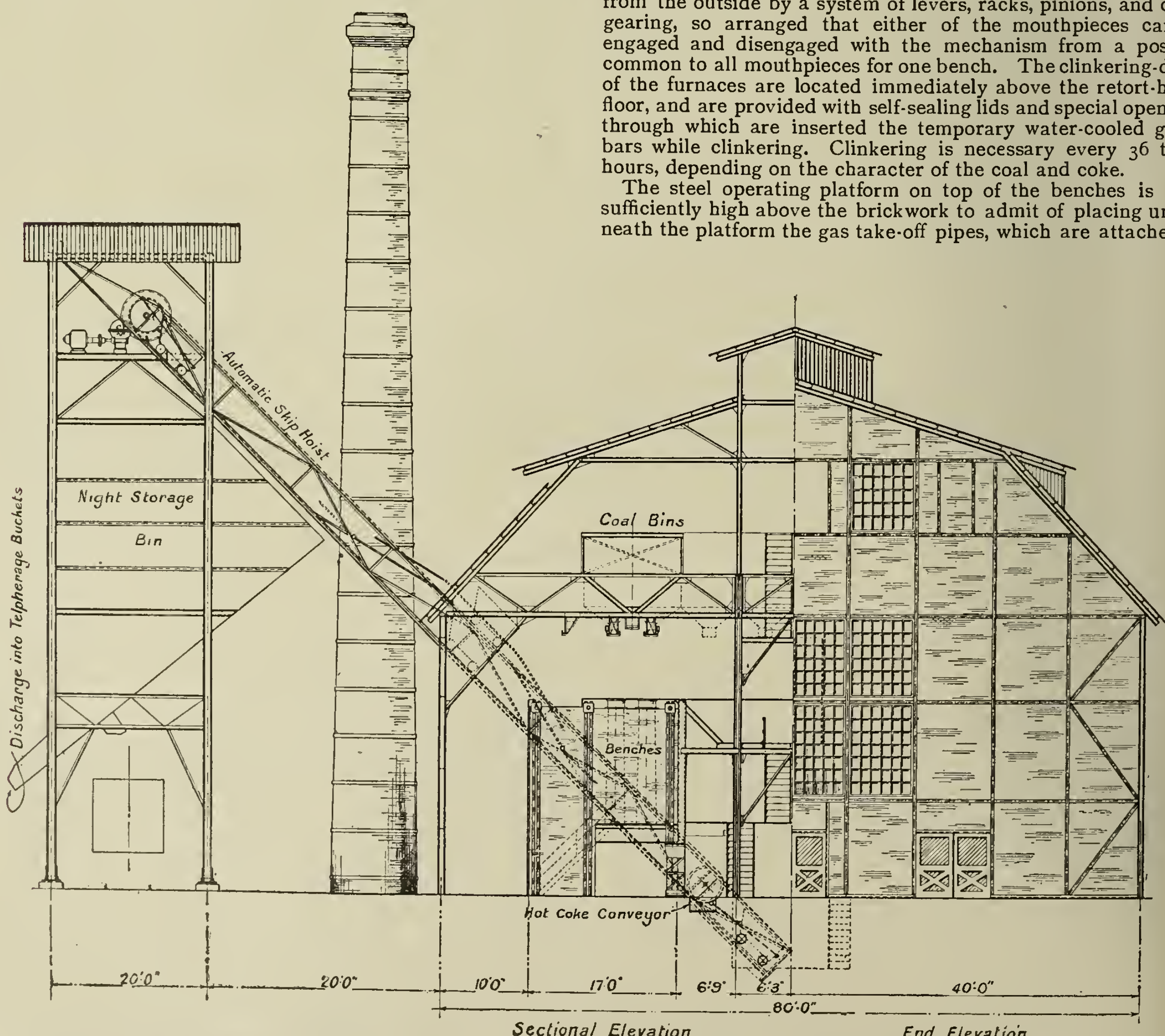


Fig. 2.—End Elevation and Cross Section of the Retort-House, Showing the Automatic Skip-Hoist and Night Coal-Storage Bin.

1e side of the top mouthpieces. They are in a horizontal position, nd pass to the outside of the benches, where they connect through n angular shaped dip-pipe to the top of the hydraulic main. Each take-off pipe is supplied with a self-sealing lid covering cleaning opening so located that both horizontal and vertical ortions of the pipe are accessible. The hydraulic mains are upported upon a special steel platform, and are supplied with ontinuous water-seals, to the top of which are attached self-ealing lids. To prevent the accumulation of solid matter which nay be carried over from the retorts into the hydraulic mains, ach of the cleaning openings is furnished with a removable pan, mmediately under the ends of the dip-pipes.

For charging the retorts with coal, there will be used a specially lesigned hopper, travelling on suspended rails fitted below the ottom of the coal bins. This hopper is suspended immediately ver the centre line of the retort-setting. It is supplied at the ower end with an ingenious device, permitting the charging-unnel to be transferred from the mouthpieces of the retorts on ne side of the bench to those on the opposite side. The lower ortion of this funnel terminates in a specially designed cone, which automatically distributes the coal entering the retorts, so hat the fine coal will be deposited immediately adjacent to the etort surfaces, while the coarse coal will form the centre core of he charge. With this arrangement, a larger number of void paces in the core of the charge are provided for than those which xist in any other portion. Through these void spaces the largest ortion of the gas is carried off, as it offers the least resistance; nd the gases are passed through under very much lower tempe-atures than those existing adjacent to the inner retort surfaces. This arrangement prevents decomposition of the hydrocarbons, nd accounts for the increase in yield and candle power.

The coal-charging hoppers, as well as the breeze and coke oppers, are all supplied with anti-friction roller bearings. The reeze-hoppers are similar in description to the coal-hoppers, with the exception that they are suspended from a single rail nstead of two rails. The breeze-hoppers are provided with a neasuring and charging device so constructed that the quantity of breeze which is put into the bottom of the retorts will only fill he lower mouthpieces and such portion of the retort as is not xposed to the direct action of the flame. The breeze thus charged nto the lower mouthpieces is not lost, but is recovered in the hape of coke, due to the fact that a portion of the heavy oil is bsorbed by the breeze, converting it into large and dense pieces by the radiant heat from the incandescent coke during the latter period of carbonization. For the charging of the generator fur-naces with coke there is supplied a cone-shaped hopper, travelling on a single rail immediately above the centre of the charging-holes, as already stated.

For each battery of benches there will be constructed a chimney of radial perforated bricks, 4 feet in diameter and 125 feet high. The chimneys will be immediately outside the retort-house, and opposite to the centre of each battery of benches. They will be connected to the main flue by a transverse flue, both located below the floor.

Coal and Coke Handling Machinery.

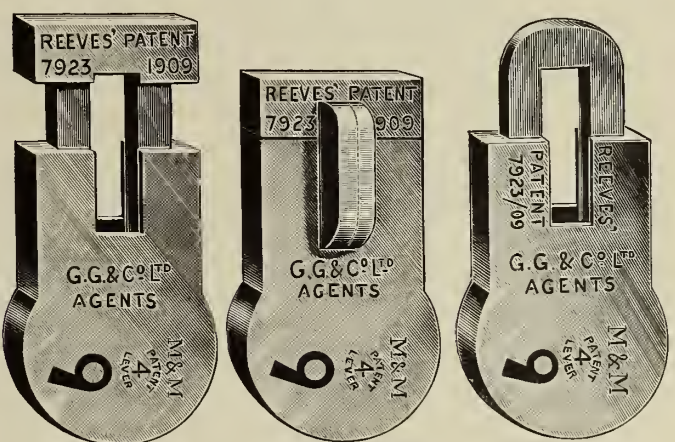
The coal will be taken either direct from barges or from the open or covered storage to the retort-house, after having been passed through suitable crushers. These will be so arranged that only the coarse lumps are passed through, while the fine coal is diverted directly to the gravity coal elevator installed in a special steel structure, situated at a distance of 24 feet from the gable wall of the retort-house, as shown in fig. 1, with the exception that the structure containing the elevators will be increased in length, so that the coke conveyors located over the storage-bin inside the retort-house may both be passed in a straight line to the point of discharge immediately under the top run of the carrier elevator. From the carrier conveyor the coal is discharged upon belt con-veyors fitted immediately above the coal storage-bins, extending throughout the entire length of the retort-house. The belt con-veyor is supplied with an automatic tripper, in order to procure a continuous and uniform deposit throughout the entire length of the bins. The arrangement of the carrier conveyors is such that either of them can supply coal to both sides of the retort-house. The capacity of the coal-handling machinery is such that the coal required for 24 hours' operation can be delivered within three hours. This apparently large capacity for present requirements is due to the fact that the machinery will supply a second house of $3\frac{1}{2}$ million cubic feet capacity in the future.

For the removal of the coke and its disposition, there will be supplied for each battery of benches a hot-coke conveyor of the De Brouwer type, with automatic quenching arrangement and expansion joints in the side of the trough, to deal with the large body of coke that is suddenly discharged and the variations of temperature that exist in the upper and lower portions of the trough. The coke will be transferred from the bottom of the retort mouthpieces to the conveyor by means of movable shoots travelling upon rails placed upon the retort-house floor immedi-ately below the discharge mouthpieces. The coke will be con-veyed throughout the entire length of the retort-house to a dis-charge head located outside, where it is provided with a discharge pocket for the purpose of either feeding the automatic skip hoist leading to the top of the storage-pocket, or discharging into dump-ing cars, which return a portion of the coke by means of a plat-form elevator to the top of the storage-bins, which, as already described, are fixed in an elevated position immediately adjacent to the gable wall of the main building. The automatic skip hoist, together with the night storage coke-bin, are shown in fig. 2. The automatic skip hoist consists of a rectangular-shaped steel latticed girder fixed in an inclined position, extending from the dis-charge head of the hot-coke conveyors to the top of the storage-bin. The hoist is supplied with two dumping-cars constantly travelling in opposite directions. To prevent an undue amount of breeze resulting from the breaking of the coke by dropping through long distances, the discharge arrangement at the top of the hoist is so designed that the coke is constantly discharged over inclined surfaces, gradually filling the bin from bottom to top. The night storage or accumulating bin is an elevated steel structure, as shown in fig. 2, having sufficient capacity for 24 hours' production, in order to eliminate all labour or attention to the handling of coke outside the retort-house during the night. The bin is constructed of steel plates provided at the bottom with dis-charge spouts controlled by swinging valves, to permit of dis-charging the coke either into railroad cars for direct shipment, or into telpherage buckets for transfer to the storage yard or other portions of the plant.

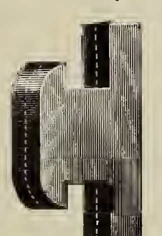
A NEW LOCK FOR SLOT-METER MONEY-BOXES.

Ever restless ingenuity has brought to us a novel construction of padlock and hasp for use on the money-boxes of prepayment meters; the designer and patentee being Mr. Robert B. Reeves, of Whitstable-on-Sea. Greater security has been the dominant object of the inventor; and he has succeeded in this object, for a firmer lock for the purpose—a lock that offers to the pilferer, through its grip and stability, more resistance—has not yet been introduced to our notice. It is quite a new departure.

The illustrations show that the form of padlock which, for the comparatively new purpose of securing the money-boxes of pre-payment meters, has retained many of its ancient attributes—a



Showing Lock Head Open. | Showing Lock Head Closed. | Enclosed Bolt Form—Showing Bolt Raised.



The Solid Hasp.

body with a swing hank, which passes through a hole in the hasp—has been completely discarded. Here we have a padlock in which the fastening hook (cut out of one solid piece of metal) slides into the body of the lock, and, when home, grips tightly a hasp notched top and bottom, which hasp is also cut out of one piece of solid metal. There are two forms (and two sizes) of the pad-lock—one in which the bolt is provided by a cross head, and, when the bolt is pressed home, the cross piece is seated on the two uprights of the body of the lock; the other in which the bolt, when pressed home, is absolutely enclosed in the uprights of the lock body. There is when fixed no open space to tempt the unscrupulous to try to force the lock by a bradawl or screw-driver; the lock sits rigidly and closely on to the face of the money-box, so that it cannot be wrenched off; nor is there any-thing that can tempt to the use of a file, as in the case of a pad-lock with an ordinary curved hank.

A key has only to be used when removing the lock from the hasp. The insertion and turning of the key cause the bolt to shoot upwards; and then the rectangular opening is made as shown in the first and third illustrations, and the padlock can be lifted off the hasp. On replacing it on the hasp, the bolt only re-quires pushing home with the fingers to securely fasten it. There is only one disadvantage that we can see—that is, on account of the special hasp, the application of the new padlock to meters already in existence; but upon this point Mr. J. William Glover (of Messrs. George Glover and Co., Limited, of Chelsea, who are the agents, and who have adapted the bolt to their "M & M" patent four-lever lock) satisfied inquiry by saying there would be no difficulty in fitting the special hasp when meters are discon-nected for repair or adjustment. In the case of new meters, the "slot-grip bolt" form of lock and hasp can be ordered. There is a difference of but a few pence in price between the old and the new forms of lock. Strength, solidity, compactness, neatness, and increased safety, are sure to make the lock a strong claimant for favour.

INSTALLATION OF CARBURETTED WATER-GAS PLANT AT ABERDEEN.

By Samuel Milne, of Aberdeen.

[A Paper read before the North British Association of Gas Managers.]

In these days of low-grade gas, when the use of enrichers is being largely abandoned, it may be considered that a carburetted water-gas installation is somewhat out of date. It must be borne in mind, however, that a carburetted water-gas plant may be used, not only as an enricher, but as an auxiliary and an adjunct to a coal-gas plant; it has advantages which should not be overlooked—producing, as it does, a gas of any desired illuminating power in large volumes, with great rapidity, and, at the same time, subject to a nicety of control.

Aberdeen has not reached the rock-bottom in regard to candle power. Prior to the year 1881, the prescribed illuminating power was 30 candles (union jet), but that year powers were obtained for a reduction to 20 candles (union jet); and a further reduction to 15 candles ("Metropolitan" No. 2) was authorized two years ago. The illuminating power at present supplied is not less than 21 candles; so that at Aberdeen the carburetted water-gas plant is used, not only as an auxiliary, but also as an enricher.

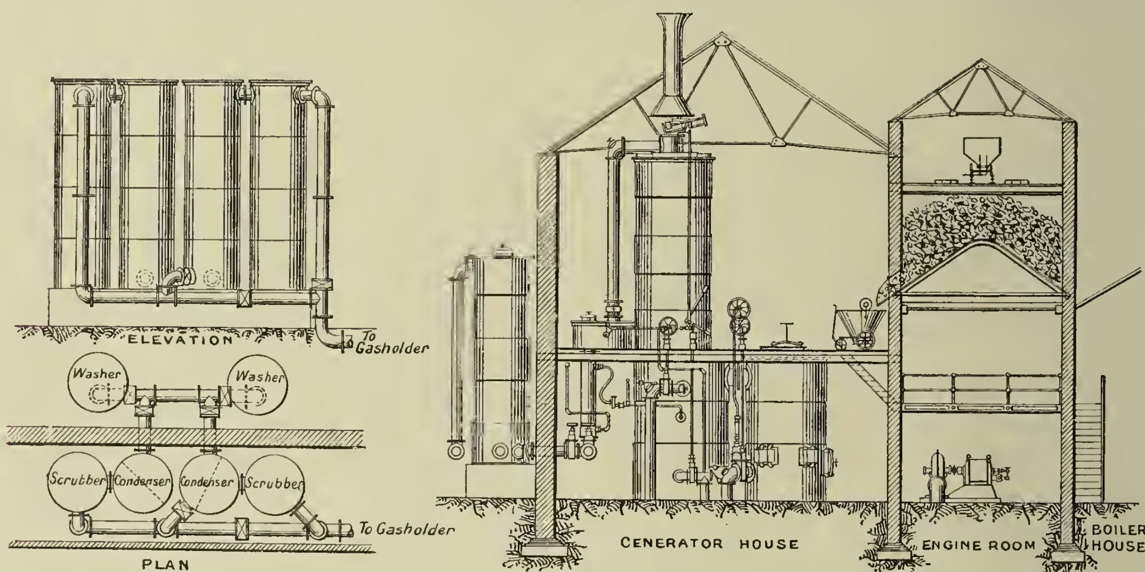
Numerous papers have been published from time to time pointing out the direct as well as the collateral advantages of such an installation; and the writer does not propose to go into these, but rather to confine himself to a description of the plant recently installed at Aberdeen. He ventures to hope that it may be of some practical value to members of the Association who may contemplate putting down an installation of the kind.

Site.—The site selected for the plant was found ready to hand. The Corporation electricity works, erected in 1893 and extended in 1896, adjoined the Corporation gas-works, and, being found inadequate and without room for expansion, being hemmed in by the gas-works, a new electricity works had to be erected in 1901 in another part of the town. The old works were subsequently taken over by the Gas Department; and one-half of the original boiler-house gave sufficient accommodation for the whole of the water-gas plant which required to be kept uuder cover.

Plant Adopted.—The plant adopted at Aberdeen was supplied and erected by the Economical Gas Apparatus Construction Company, Limited, under the Merrifield-Westcott-Pearson patents. With the exception of the blowing plant, it is of British manufacture, and the first of this particular type to be installed north of the Tweed.

Capacity of Plant.—The plant at present installed consists of two sets, each capable of producing 750,000 cubic feet of gas per twenty-four hours, after the carbonic acid and other impurities have been removed, and the gas corrected to standard temperature and pressure. It comprises generators, superheaters, fixing-chambers, washers, condensers and scrubbers, tar-extractor, tar and liquor separating tank, a relief holder, exhauster, purifiers, and meter; also a boiler for steam raising, air-blowers driven by steam-turbines, pumps for circulating water through the gas-condensers, feed pump for the boiler, pumps for circulating water through the washer and scrubber, and pumps for injecting oil into the fixing-chamber, as well as an elevator for coke and an oil-storage tank. The pumps and blowers are all in duplicate.

Steam-Boiler.—The steam-boiler is of the Lancashire type, 28 feet long by 7 ft. 6 in. diameter, with two flues 3 feet in diameter, each having four cross tubes, and built for a working pressure of 120 lbs. per square inch. The boiler is placed upon, and the flues are covered by, patent adjustable blocks, which provide



The General Arrangement of the Carburetted Water-Gas Plant at Aberdeen.

ready access for examination of the boiler, and, at the same time, form a strong and substantial setting.

Steam-Piping.—The main steam-pipe is of steel, and is 5 inches in diameter at the boiler, reducing to 4 inches. It is led to the engine-room, where a 2½-inch branch is taken off for the steam turbines, and a 2-inch steam-ring is carried round the engine-room to supply the various pumps. The steam-pipe leading to the generators is 2 inches in diameter, branching down to 1¼ inches to each generator. A Holden and Brooke's steam drier is introduced into the line of piping as it enters the engine-room; and Geipel and Lange steam traps are provided where necessary. It is very desirable to have dry steam both at the turbines and also at the generators.

Pumps.—The feed-water to the boiler is from the town's supply, and is led to one of Wright's patent multiplex detartarizers, where its temperature is raised to nearly 200° Fahr. by the exhaust steam from the steam-turbine and pumps. This open type of heater was selected on account of the fact that it does not cause back-pressure upon the turbine. The water gravitates from the heater to a Worthington pump, and thence to the boiler.

The water used for condensing the gas is drawn from one of the gasholder tanks; is circulated through the condensers; and discharges into another gasholder tank. The two tanks, which act as condensing ponds, are connected by a 6-inch pipe. This water is circulated by a Deane pump, 9 inches by 5½ inches by 10 inches, made by the Pulsometer Engineering Company, and is given out as being capable of delivering 3420 gallons of cold water per hour, at a piston speed of 60 feet per minute. A second pump, of the same size and construction, is arranged as a stand-by either to the condenser pump or to the boiler feed.

The pumps for circulating the effluent liquor which has been separated from the tar, &c., deposited from the washer, condensers, and scrubbers are of the horizontal duplex piston type, brass fitted throughout—size, 5¼ inches by 4¾ inches by 5 inches; capacity, 125 gallons per minute. They were manufactured by the Snow Steam-Pump Company. The same type of pump, but smaller, is used for drawing the oil from the storage tank and delivering it through the meters and injectors to the superheaters, at a pressure of 30 lbs. to 35 lbs. per square inch.

Blowers and Turbines.—The blowers provide an air-blast to the generators, superheaters, and fixing-chambers. They are of the Sturtevant type, No. 8, with 18-inch outlet connections, and capable of delivering 13,000 cubic feet of air per minute, at 12 oz. pressure, when running at 1800 revolutions per minute. Each is directly coupled to an 18-inch Kerr steam-turbine of a six-stage type, manufactured by the Kerr Steam-Turbine Company, of Wellsville, New York.

The Kerr steam-turbines are of the multi-stage, bucket and nozzle, impulse type, each stage consisting of a set of nozzles and a bucket wheel, with double cup-buckets set in its periphery. The whole is enclosed in a sectional casing of cast iron.

When steam of high-pressure is expanded in a properly constructed nozzle to atmospheric pressure, or into a vacuum, its velocity is said to reach 3000 to 4000 feet per second.

In order to properly utilize the energy of high-pressure steam, it is necessary, in a steam-turbine of this type, to make a number of drops in pressure from stage to stage—each of such amount as will produce a steam velocity in each stage proportionate to the peripheral velocity of the bucket wheel against which it works. This is claimed to have been accomplished in the design of the Kerr turbine by a correct proportioning of the steam-nozzle areas of the different stages.

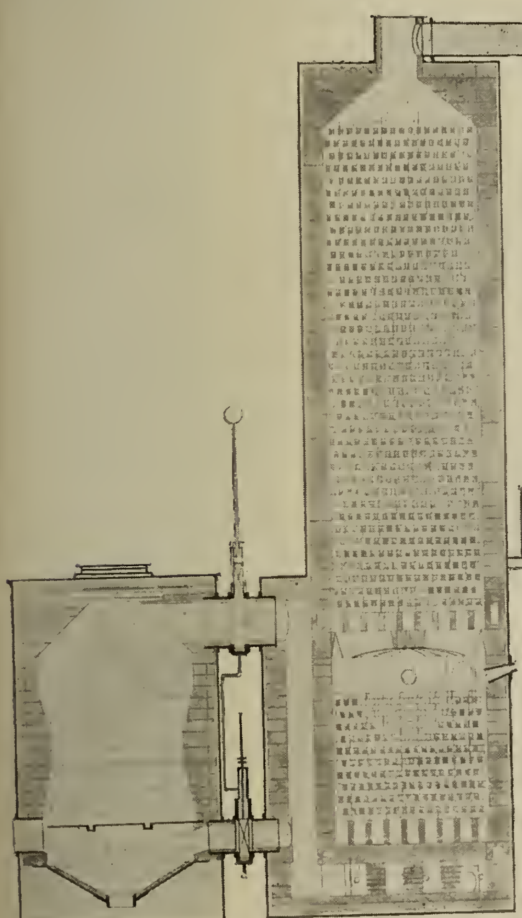
In the design of the turbine, simplicity and reliability have evidently been kept in view; and, as there is only continuous rotary motion to deal with, the result has been a machine of extreme simplicity, and, judged from turbines which have been in operation for a considerable time, also one of great reliability. There are two points only at which the shaft is in actual rubbing-contact with the stationary parts of the turbine, and these are the bearings.

The shell or cylinder of the turbine is made up of two end castings, between which are diaphragm castings, which contain the nozzles, and divide the cylinder of the turbine into separate stages. The diaphragms are accurately centred with each other, and with the two end castings, by turned or bored tongue, and groove-joints. Outside the groove, the diaphragms are in contact on an accurately faced metal-to-metal joint. The groove is packed with fibrous packing. The end castings carry the weight of the turbine, and are provided with accurately faced supports which are bolted to the bed-plate.

The spindle or rotor is made up of a steel shaft, upon which are mounted the bucket wheels, the number of which depends upon their own diameter, the range of steam pressure under which the turbine is to operate, and the number of revolutions per minute of the driven machine. The bucket wheels are machined from flange steel, and are slotted to receive the buckets, which are secured in place by dovetail slots, into which the shanks of the buckets are inserted and riveted.

The weight of the rotating element of the turbine is comparatively light. This makes it practicable to use a small diameter shaft both in the bearings and in the glands where the shaft passes through the turbine casing, and permits the design of a bearing which is at all times safe from overheating. The actual surface speed of the shaft in the bearing is not great, notwithstanding the high rotative speed of the shaft; and it reduces to a minimum any possible difficulties that might arise from a high surface-speed at the glands.

The governor, which is of the centrifugal type, is mounted on the end of the shaft, and rotates with it.



Cross Section of the Generator, Superheater, Fixing Chamber, and Washer of the Merrifield-Westcott-Pearson Carburetted Water-Gas Plant.

The Kerr turbines appear admirably suited to this class of work. They are simple in construction, smooth running, and self governing; they run at a comparatively slow speed, and, being directly coupled, are without objectionable gearing; and in actual practice it is found that, when running at 1800 to 1900 revolutions per minute, they give a pressure of 20 to 23 inches head of water when no blast valves are open, and maintain a pressure of about 17 inches when the air blast to the generator and superheater are open to their usual capacity.

Coke-Elevator.—A Tangye ram-pump is employed to operate a hydraulic hoist for raising coke to a large overhead hopper constructed over the engine-room, and adjacent to the operating floor. A hopper waggon is placed on the cage of the hoist at such a level as will enable it to receive a cart-load of about 13 cwt. of coke. This is elevated to a height of 36 feet, at which level it is run on to a line of rails, and by opening a sliding door its contents are deposited where required in the coke-storage hopper. Three shoots lead from this hopper to the operating floor of the generator-house at such a level as to allow of all the coke dropping into the charging buggies for the generators. These shoots have just been fitted with a screening arrangement which thoroughly removes all dust and breeze—allowing the large coke to fall into the charging buggy and bye-passing the breeze to the ground floor, whence it is removed to the boiler to be used as fuel.

Generating Plant.—The generator-house is a two-storey building. The ground floor is 16 feet high; the upper or operating floor is 20 ft. 6 in. high to the eaves. Upon the operating floor all valves, gauges, meters, and levers are assembled; so that the operator has everything at his hand and under observation.

The generators are steel cylinders, 8 ft. 6 in. in diameter by about 16 feet high, formed of ⅜-inch steel plates, and lined with 12 inches of fire-bricks in two thicknesses, with about 3 inches of silicate cotton wool packing between the fire-bricks and the cylinder. The fire-bars are of 2-inch by 2-inch steel, at the level of which are five cleaning doors to facilitate clinkering operations. Below the fire-bars there is a hopper-shaped portion for collecting the ash and small clinker which pass through the bars, and from which the gas off-take for the down-runs is placed, as well as the steam inlet for the up-runs and the blast connection. The hopper bottom is fitted with a self-sealing door, operated by a lever, which can be locked into position. The top of the generator is also fitted with a self-sealing door 2 feet diameter, with a sight cock in it. There are two gas off-takes—one near the top of the generator and the other leading off the hopper near the bottom just referred to. Each is fitted with a valve—either dry or wet, as may be selected. The upper off-take valve is used when making an up-run—*i.e.*, when passing the steam in an upward direction through the fire; the lower off-take is used for down-runs, of which there is, on a average, about one for every four up-runs. The steam connection for the down-runs is situated near the top of the generator.

Unlike another type of plant which has very largely been installed in this country, the one under consideration has the fixing-chamber placed over the superheater, forming one piece, where the other type referred to has two separate pieces of apparatus to accomplish the same end. Both makers, of course, claim their own design to be the best.

The superheater follows the generator, and is about 15 feet high, while on plan it is in the form of an elongated cylinder, 10 feet by 8 feet, with semi-circular ends. This allows of the superheater being 5 ft. 10 in. in diameter inside, while the remaining space is occupied by a fire-brick-lined vertical duct, down through which the products from the generator reach the superheater. The fixing-chamber is a continuation of the superheater, and stands 21 feet high, and is also 5 ft. 10 in. inside diameter. Like the generator, the superheater and fixing-chamber are lined with fire-bricks to a thickness of about 10 inches, and having about 3 inches of silicate cotton packing between the fire-brick lining and the outer steel shells. Within these chambers a mass of chequer fire-brick is so arranged as to form a perfect baffle, and to present a large heating surface to the flow of the gas. Two air-blasts are introduced—one near the bottom of the superheater, the other near the bottom of the fixing-chamber. Each air supply is controlled by a valve, and enters an annular chamber, from which there are numerous outlets around the circumference of the vessels so arranged as to give an equal distribution of air over the entire area.

A T-piece is fixed on top of the fixing-chamber, the vertical branch of which carries the stack-valve, which opens to the atmosphere; the side branch leading the gases to a 14-inch down-take pipe. This pipe is sealed in the washer, which is nothing more than a seal-box 6 feet in diameter by 3 feet high. The seal prevents the back-rush of gas from the gasholder when the stack-valve is opened to the atmosphere. As a further precaution, a pivoted valve is fitted to the seal-pipe, which closes simultaneously with the opening of the stack-valve by the pulling of one lever. An overflow from the washer is led to a seal-pot. The gas passes from the washer in a downward direction through a pipe which stands a few inches above the water in the washer, and is conducted to the inlet of the condenser. Use is made of the hot gas passing down this pipe to heat the oil before entering the superheater, by having a coil of steel tube placed inside the gas down-take pipe. The oil enters at the bottom of the coil and leaves at the top.

Course of Oil.—It may be interesting at this stage to consider the course of the oil from the storage tank until it becomes a fixed gas. The oil gravitates or is drawn from the oil-storage tank to the pumps; is then forced through a Worthington meter situated on the operating floor through the regulation valve; then to the heating coil referred to; and thence to the injectors or sprayers, of which there are three arranged around and near the top of the superheater, and all upon the same level. The ends of the injectors are in the form of a union-jet burner—*i.e.*, the two small jets are so arranged that when the oil passes through them, it spreads out in a flat sheet of fine spray or invisible mist, right across the superheater at right angles to the flow of gas. The small orifices in the injectors can be effectually cleared when required by fine wires operated by a lever arrangement which is easily accessible; and this, although seldom necessary, should occasionally be attended to.

By introducing the oil at the position mentioned—namely, near the top of the superheater—it is thoroughly vaporized by the heat of the water gas as it passes through the duct and superheater; and having a considerable mass of heated brickwork between the generator and the points of injection, it is not affected by the changes of temperature which must necessarily occur on account of the condition of the fuel bed in the generator, which is

at times perfectly black, and at other times may be approaching a white heat.

Scrubbers and Condensers.—In the plant under review, there are two scrubbers and two condensers, and they are so arranged that either set of one condenser and one scrubber may be used independently, or the gas may be made to pass through the four vessels. This arrangement has been found to be very satisfactory; and the fact of being able to operate the two sets independently will be a great convenience should any fault develop in one or other of the single sets.

The scrubbers are vertical, and are constructed of steel shells, 22 feet high by 6 feet in diameter, filled with wooden grids, forming a baffled course for the gas. The effluent liquor pumped from the tar and liquor separating tank is introduced at the top of the chamber, and is deposited at some pressure on to sprinklers, which distribute the water over the entire area. The water is run off to a seal-pot, and thence back to the separating tank.

In external appearance the condensers resemble the scrubbers. Each is divided into two compartments, so that the gas coming in at the bottom passes up through one series of tubes to the top, and over and down through another series of tubes to the bottom. Each condenser has a total cooling surface of about 3128 square feet. The condenser water circulates around the tubes—entering near the bottom and being led out at the top. The condensed products are drained into seal-pots. The outlets from all the seal-pots are connected to a 6-inch pipe, which conveys the tar and liquor to the separating tank.

Tar and Liquor Separator.—The separator tank for the tar and liquor is one of the most perfect the writer has seen. It is constructed of concrete and divided into three compartments, containing the separator, the tar, and the liquor respectively. The separator consists of a rectangular box, 22 feet long by 3 feet wide and 9 feet deep. It is placed underground, at such a level as to allow the tar and liquor to gravitate from the seal-boxes of the condensers, scrubbers, and washers to the top of the separator, and is divided into seven separating compartments by means of diaphragm plates, which extend to within 4½ inches of the bottom of the box. Each diaphragm plate, except the last one, reaches to within 13 inches of the top; and alongside each plate there is a skimming plate extending from the top to about 8 inches below the top of the diaphragm plates.

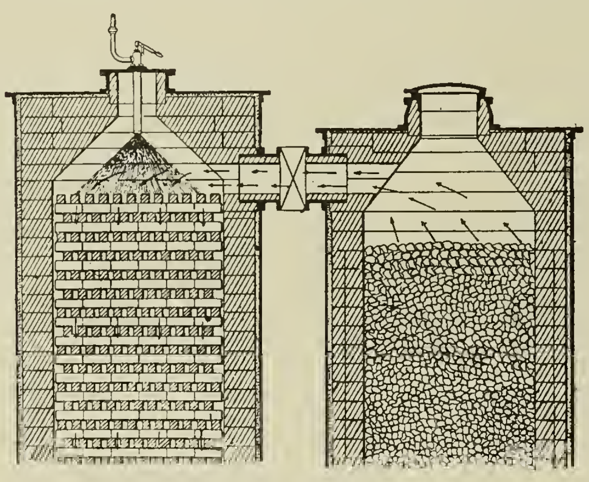
The tar, being slightly heavier than water, sinks to the bottom, and what tar may pass over the skimming plates in the first chamber is taken up by one or other of the succeeding chambers. The tar-chamber is placed at the opposite end of the box from where the mixed liquors enter; and the tar is syphoned into a storage tank, from which it is pumped to an overhead tank. It is then run into tank-waggons and conveyed to the chemical works, or it may be worked up along with the coal tar as desired.

The water or effluent liquor is run into one of the compartments of the concrete tank, and passes over a series of brick partitions. Before overflowing to the drain, it is again twice skimmed. Near the outlet is the suction pipe and foot-valve for the effluent liquor pumps, which re-circulates it to the washers and scrubbers.

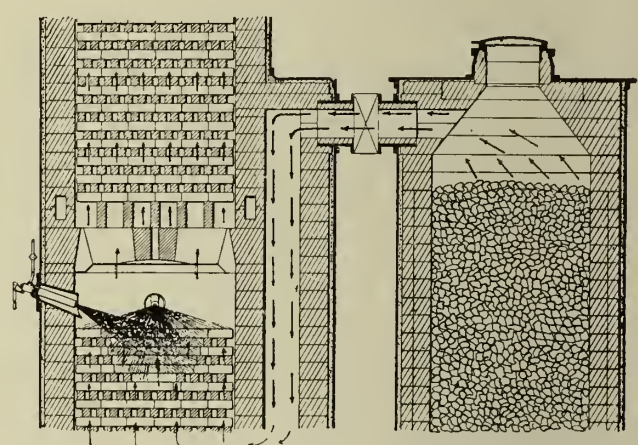
Our experience with Scotch shale oil, over six months' working, showed that the quantity of tar sold represented 19½ per cent. of the oil used.

Tar-Extractor.—One of Colman's "Cyclone" tar-extractors is placed on the inlet of the relief holder. The machine is constructed of No. 10 gauge steel, riveted together. The upper part is cylindrical, while the lower part is conical. The inlet for the contaminated gas supply enters the side of the upper part at a tangent; and the outlet is taken off the crown. The lower or conical part terminates in the tar outlet, which is led in a 3-inch pipe, and sealed in the separating tank.

The principle of its action is said to be as follows: The gas is blown into the separator through the tangential gas inlet, and assumes a whirling motion, forming a vortex, by which the tarry particles are driven by centrifugal energy to the outside of the whirling gas, and pass down the inner surface of the conical chamber, at the bottom of which they are discharged. The helical stream of whirling gas descends towards the bottom of the cone, and, practically free from tar, turns inwards and upwards in a spiral column through the gas outlet at the top or crown of the machine.



Ordinary Double Superheater Type.



Merrifield-Westcott-Pearson Type.

Diagrams showing Comparison of Two Oil-Injecting Systems.

While not in a position to state the quantity of tar and liquid deposited by this extractor, the writer is satisfied that good work is being done; and he has never observed the slightest appearance of tar on the grids of the purifiers.

Relief Holder, Purifiers, and Meter.—In working a carburetted water-gas plant, a relief holder is necessary to take up the intermittent makes and to supply a constant flow of gas to the exhauster and purifiers. But the holder need not be a very large one, although in Aberdeen one of the existing gasholders, of about 580,000 cubic feet capacity, is used. Large storage capacity is certainly a convenience, because, if only two eight-hour shifts are being worked, the exhauster may be run continually throughout the twenty-four hours at a slow uniform rate per hour.

In the case of the plant at Aberdeen, no additional capital was expended upon gasholder, exhauster, or purifiers.

A slight rearrangement of piping and the introduction of a few valves allows of this portion of the plant being made suitable for either coal gas or carburetted water gas.

At the outlet of the purifiers, a rotary meter, of a capacity of 40,000 cubic feet per hour, is installed. The carburetted water gas, on being measured here, unites with the coal gas, and together pass through the station meters, and thence to the gasholders.

Operating the Plant.—To start-up the plant a fire is kindled upon the grate-bars, and coke is added from time to time until the generator is about two-thirds full. During this operation, natural draught only is required; the front fire-door and stoke-holes, also the generator lid, being open for a start.

When there is sufficient depth of fuel in the generator, and all is well alight, the stokehole and front firing-doors are closed; the hopper bottom of the generator is filled with water; the charging lid is closed; and the blast is turned on to the generator—the stack valve being open to the atmosphere all the while. After blowing for about ten minutes, a little steam is admitted to the underside of the generator to keep the clinker disintegrated and to prevent injury to the fire-bars.

When the coke in the generator has been brought up to a dark cherry red, which may be observed by the sight-cock fixed on the charging lid, the gas can be ignited in the superheater by opening the blast-valve to same. As soon as ignition has taken place (as can be observed at the sight cock fixed on the superheater), a little more superheater blast may be applied to expedite the heating of the fixing-chamber.

As soon as the superheater gets red, its blast may be reduced a little, and the fixing-chamber blast opened to ignite the gas there. When ignited, more blast may be added to bring up the temperature to the required pitch.

At this stage it will be necessary to replenish the fuel-bed. The air-blast is shut off from the fixing-chamber; then from the superheater; and lastly, from the generator. The steam is then shut off, and the generator charging lid is "struck" and opened up.

The generator should now be filled up with coke to within about a foot of the gas off-take, and the fuel levelled-up and then spread to the sides, forming a saucer-like surface. The charging lid is then closed, and the heats are raised as before. When the generator fire is in a proper condition, and the heat in the superheater shows a cherry red and straw colour in the fixing-chamber, all is ready for making a run of gas. After making a couple of preliminary trials, the water is run off the hopper bottom of the generator, and the clinker and ashes are removed. After everything is in perfect working order, the normal procedure for making a "run" and "blow" is as follows: Shut down blast-valves to fixing-chamber, superheater, and generator; turn on steam to generator; shut stack-valve; then turn on oil. The oil must be so regulated that the quantity (3 to 4 gallons, according to quality

of gas desired) shall be delivered in 5 to 5½ minutes; leaving about one-and-a-half minutes' gasmaking to continue after the oil is shut off. Thus the water gas from the generator will take up any residue of oil gas which may be in the superheater and carry it forward to the relief holder. As soon as the oil is shut off the injectors, a little steam is permitted to pass through them to keep the nozzles clean and cool.

At the end of seven minutes (which is termed the "run"), the steam is shut off and the stack-valve opened; the blast to the generator and the superheater are opened; and, only if required, a little blast is admitted to the fixing-chamber. This is to recover the heats, and, in normal working, occupies four minutes.

The cycle of operations goes on regularly at four minutes' blow and seven minutes' run; and the routine work is so simple in practice that a labourer of ordinary intelligence can become an efficient operator in two or three days.

As already mentioned, there are generally about four up-runs and then one down-run. If steam were always admitted at the bottom of the generator, the fuel-bed would become chilled and inactive and saturated with moisture through the condensation of the steam. The result of this would be a poor yield of gas and an excess of carbonic acid in the finished gas. By closing the top gas off-take occasionally and reversing the process—admitting the steam over the fuel bed and causing the hot gas to pass down and escape at the bottom gas off-take—the base of the fuel bed is recuperated to some extent, and the work is more equally distributed throughout the entire fuel bed.

The closing of the top gas off-take valve automatically opens the bottom off-take, and *vice versâ*. There is thus no possibility of making any mistake, and the steam-valve for the up and down runs are situated close together upon one standard, and within easy reach of the operator.

The generator has to be supplied with a buggy of fuel at intervals of about 40 to 50 minutes, as required, and cleaned once each shift. To facilitate the operation of clinkering, spear-bars are introduced at all four stokeholes to carry the fuel bed, while the ash and clinker are removed from the bars.

Men Employed in Operating.—To operate one section of the plant described—*i.e.*, to make 750,000 cubic feet per twenty-four hours—three shifts are worked; and on each shift one boilerman (who also attends to the pumps and other machinery in the engine-room), one operator, and an assistant are employed—*i.e.*, three men per 250,000 cubic feet or thereabouts. Assistance is given in elevating the coke, which, for twenty-four hours' requirements, only occupies a few hours of two men, and assistance is also given in wheeling out the ash and clinker from the generator.

The clinkering of the generator takes place once per shift, and the off-going shift remains to assist the on-coming shift in the operation, which occupies from 60 to 80 minutes.

Purification.

Practically the only impurities to be removed from carburetted water gas are the sulphuretted hydrogen and the carbonic acid. The proportion of the former depends upon the amount of sulphur contained in the coke and oil employed, and is only about one-fifth of that contained in coal gas, while the carbonic acid to be removed is about 3 per cent. by volume. In Aberdeen, the purification of the carburetted water gas is conducted separately from the coal gas—a small set of four purifiers being used for the purpose (three on and one off). In each box, there are two layers of material containing about 6 inches of "Lux" purifying material, mixed with coke-breeze in the proportion of one to two, and an upper layer of English lime, 5 inches thick. Repeated tests have demonstrated that the presence of carbonic acid is practically *nil*, when sulphuretted hydrogen is evident by the acetate of lead test. This, as it happens, is very convenient, as the shift foreman, whose duty it is to test the purifiers, has a ready means of knowing when to change a purifier. The cost of purification (labour and material) has been 1·1d. per 1000 cubic feet; but it is expected that this figure will be reduced during the coming winter.

Composition of Gases.

According to Professor Alex. Crum Brown, the percentage composition of coal gas and carburetted water gas, each of about 25-candle power, is, in round numbers, as follows:—

	Ordinary Coal Gas. Per Cent. by Volume.	Carburetted Water Gas. Per Cent. by Volume.
Heavy hydrocarbons	9	13
Carbonic oxide	11	32
Methane	35	21
Hydrogen	40	25
Nitrogen	5	6

Oil Supply and Storage.

The oil used at Aberdeen is distilled from Scotch shale chiefly found in the counties of West and Mid Lothian. Gas oil is the third fraction of the crude oil; the first being naphtha, which distils at a temperature of 130° to 360° Fahr., and has a specific gravity of ·675 to ·775. The second fraction is burning oil, which distils at a temperature of 284° to 560° Fahr., specific gravity of ·765 to ·830. Gas oil has a specific gravity of ·840 to ·870; and regular fractionation may be relied upon within the limits of 484° and 755° Fahr. It has a flash-point of from 200° to 220° Fahr., which is well over the minimum demanded by the Petroleum Act, 1879, which is 73° Fahr. The oil is a bye-product, and is chiefly used for enriching carburetted water gas and the manufacture of oil gas by Pintsch's process. Delivery is given in tank-waggons, containing from 8 to 13 tons. The waggons are run into a siding, and placed over a receiving-box fitted with a fine wire gauze, which arrests all sediment. On opening the cock which is fixed under the waggon, the contents pass over the gauze screen into the receiving box; thence by gravitation to a tank placed underground. A 2½ B.H.P. gas-engine drives a centrifugal pump which delivers the oil into the storage tank.

The storage tank is 35 feet in diameter by 18 feet high, and rests upon a concrete foundation 37 feet in diameter by 12 inches thick. It is constructed of steel plates, and is roofed with light sheeting on trussed framing, similar to a gasholder crown. The oil-inlet pipe reaches to the top; while the outlet is placed at a level 4 inches above the bottom. This allows of about 3½ inches of water being stored in the bottom, which is less liable to leak than oil; and if leakage does take place, water is lost and not oil. Two test-cocks are fixed on the side of the tank, to indicate the water and oil levels respectively. The tank is capable of storing upwards of 400 tons of oil, or 104,000 gallons.

The equivalent of one ton of oil to one ton of coal (for comparison of storage) is interesting, and may be found thus—

1 ton of water = 2240 lbs.
1 gallon do. = 10 lbs. ∴ 1 ton water = 224 gallons.

The specific gravity of oil may be taken to average ·860.

$$\therefore \text{1 ton of oil} = \frac{224 \times 1000}{860} = 260 \text{ gallons.}$$

For every 1000 cubic feet of gas made, of (say) 25-candle power, it may be reckoned that 3½ gallons of oil are required; and as one ton of oil contains 260 gallons—

$$\text{1 ton of oil} = \frac{260 \times 1000}{3\frac{1}{2}} = 74{,}285 \text{ cubic feet.}$$

Taking one ton of coal as equivalent to 10,000 cubic feet, one ton of oil will be equivalent to $\frac{74{,}285}{10{,}000} = 7{\cdot}42$ tons.

It will be seen that 400 tons of oil are equivalent to 2968 tons of coal of 25-candle power, and occupy an area only 35 feet in diameter, which is a consideration of no small importance, especially when the country is threatened with a "coal crisis."

Oil Equivalent in Coal.

In making up comparisons for coal contracting, the writer's practice has been to work out the oil equivalent in tons of first-class cannel coal as follows:—

1 ton of oil = 260 gallons, and 4 gallons = 1000 cubic feet.

$\text{1 ton of oil} = \frac{260}{4} \times 1000 = 65{,}000$ cubic feet (of which about 22,000 cubic feet are pure oil gas).

and 1000 tons of oil = 65,000,000 cubic feet, or equivalent to (say) 6000 tons of rich cannel coal.

1000 tons of oil	at 55s. per ton =	£2750
1450 ,,	coke at 12s. ,, =	870
	Water (say) =	20
		£3640

The raw materials required to convert 1000 tons of oil into gas cost £3640; but as this is equivalent to 6000 tons of rich cannel, the equivalent of the oil in tons of cannel coal = £3640 ÷ 6000 = 12s. 2d. per ton. But in working carburetted water gas, residuals are lost to the extent of (say) 6s. 2d. per ton, which brings up the cost per ton to 18s. 4d. On the other hand, there is less labour and purification required, equal to 1s. 3d. per ton, which falls to be deducted. So that one ton of oil is reckoned equal to six tons of cannel coal of 28-candle power, costing 17s. 1d. per ton.

The present contract price of rich cannel is 28s. 2d. per ton delivered into stores at the Aberdeen Gas-Works. Needless to say, the order for cannel has been considerably reduced, while the order for gas oil has been correspondingly increased.

In passing, it may be noted that the current price of ordinary splint coals is from 14s. to 15s. 6d. per ton delivered into the gas-works at Aberdeen.

Working Results at Aberdeen.

On p. 320 are given the working results obtained upon the carburetted water-gas plant at Aberdeen over a period of three months last winter, during which time 50,711,000 cubic feet of carburetted water gas were manufactured, and which is only about 73 per cent. of what one set of apparatus is capable of producing.

It will be seen that the oil is the important factor in the matter of cost. An advance of 1d. per gallon represents about 3½d. per 1000 cubic feet, and is equivalent to an advance of 3s. per ton of coal. It was with feelings of gratification, therefore, that the writer was able to fix the current year's contract for oil at £2 15s. per ton delivered at Aberdeen, which is equivalent to 2·53d. per gallon—a drop of 17s. 6d. per ton, or 0·82d. per gallon on last year's prices.

The carburetted water gas for the current year will, therefore, work out at about 2¾d. per 1000 cubic feet less than it cost last winter, or about 13·35d. into the gasholder. The reduction in the price was all the more welcome from the fact that rich cannels have been advanced 4s. per ton on last year's prices.

The geographical position of Aberdeen—with its seaport, and regular traffic with the Continent, together with the Free Trade policy still obtaining—is doubtless responsible for the favourable terms upon which oil has been offered by the home producers.

As the production of carburetted water gas is dependent upon coal gas, it cannot be considered otherwise than as an accompaniment and auxiliary to that process; and besides being a

Average Price per 1000 Cubic Feet of Carburetted Water Gas of an Average Illuminating Power of 25 Candles, over a Period of Three Months (Intermittent Working).

Oil, 3·44 gallons at 3·35d. per gallon (£3 12s. 6d. per ton)	11·52d.
Coke for generator, 42·8 lbs. at 12s. per ton	2·75
Coke and breeze for boiler, 17·3 lbs. at 7s. per ton	0·64
Wages for manufacture (including all casual labour required)	0·97
Wages for purification	0·23
Lime for purification, 8·96 lbs. at 18s. 3d. per ton	0·87
Water for steam-raising, &c., 10·5 gallons	0·05
	17·03d.
Less for residual tar	0·93
Net price into gasholder	16·10d.

Gas made per hour over the daily gas-making of twenty hours averaged	38,000 cubic feet.
Gas made per ton of coke used in generators	52,336 ,,
Candles per gallon of oil per 1000 cubic feet	7·46
Specific gravity of the gas	0·659
Heating value of the gas	670 B.Th.U. Gross. or 616 ,, Net.
Carbonic acid in crude gas	2½ to 3½ per cent.
Tar sold—percentage of oil used	19½
Selling price of tar at gas-works	1¼d. per gallon.

The coal gas for the same period (coal costing 16s. per ton or 18·61d. per 1000 cubic feet), less residuals, worked out at 15·14d. per 1000 cubic feet for gas of 20½-candle power; while the mixed gases for the same period were 15·31d. per 1000 feet for gas of 22½ candle-power.

convenient enricher, it has claims to adoption in other respects. Its merits as an emergency plant are worth consideration. It is possible from dead-inactivity to have the plant brought into full use in five hours, and dropped in as many minutes without injury to the plant; while the cost for hanging the plant ready for use is very little. It will be conceded also that it is almost independent of labour; for inexperienced men, under competent personal supervision, could assume control of a plant in an emergency.

With a normal coke stock, it affords partial independence of coal supplies; while its absorption of coke stocks tends to maintain prices of that product, and saves labour in handling it.

The plant erected at Aberdeen is most complete and up-to-date, has fulfilled the writer's highest expectations, and is a credit to the Contractors, who carried out the work expeditiously and thoroughly. The first season's working results speak for themselves; but that short experience has suggested certain improvements in working which will be given effect to next winter. It might also be mentioned that working results for short periods could be produced which would show superior results to that given. But such rosy statements, while useful as a contractor's advertisement, are rather misleading; and the writer ventures to hope that the results of three months' working will be more acceptable to the members of the Association.

Discussion.

Mr. A. Yuill (Dundee) congratulated the author on his paper. He hoped that since Mr. Milne had now ventured to come into the arena, they would have more of his productions in the future. Mr. Milne had given them particulars regarding the construction of the plant, together with the results he had obtained. On these two points they could not offer criticism. Anyone who had had similar plant at work might compare notes with him, mainly as to costs. There were not many carburetted water-gas plants in Scotland. He thought they were only to be found in Aberdeen, Dundee, and Edinburgh. The results Mr. Milne had obtained coincided very much with his own experience. The plant Mr. Milne had differed somewhat in construction from the one he (Mr. Yuill) had, which was Humphreys and Glasgow's system; but in the working results they arrived pretty much at the same figures. In his own experience, he found the plant most beneficial in the past; and he thought he might look forward to greater benefit, more particularly when they had a coal crisis before them. In the present situation, they could understand the benefit it conferred upon them, because, in his own case, he would be able to lessen the coal consumption per day to the extent of 75 tons. This meant a good deal when coal supplies were scarce, and they had not a good stock on hand. He hoped that the difficulty which they were all interested in, more or less, might pass away, and that those who were trying to bring about a better state of feeling between masters and men would be able to do so. Mr. Milne, in describing his plant, spoke of 12 oz. pressure. He worked this out, and found that his pressure was 21 oz., which practically meant 21 oz. on the water gauge. He found it most advantageous to work at this pressure. He ran the blower at 2000 revolutions per minute, as against 1800 revolutions in Aberdeen. With reference to the number of men employed, being the same size of plant it naturally followed that the same number were engaged; and he found that the men required to work practically the same as in Mr. Milne's experience. In the purification, the only thing which troubled them was, naturally, the carbonic acid; and it depended to some extent on the temperature, or the heat in the superheater. He generally found in working about 2 per cent. of carbonic acid. He could use both the purifiers and the gasholders for coal gas.

Mr. D. Robertson (Dunoon) said there were some figures he would like Mr. Milne to explain to them. The author said that the proportion of impurities in carburetted water gas was just about one-fifth of those in coal gas, and he told them that the cost of purifying material was 1s. 1d. per 1000 cubic feet. These figures seemed somewhat contradictory, because if the cost were 1s. 1d. per 1000 cubic feet, then the cost of purifying coal gas must be five times as much. He could not understand this part of the paper.

Mr. G. R. Hislop (Paisley) remarked that he was not in a position to speak from experience of the working of carburetted water-gas plant. Although he had had it in contemplation for some time, he had not yet introduced it; but he might have it. He noticed the matter of purification, as being about twice the amount he generally set down as the cost of the purification of coal gas. Possibly there might be some little mistake. However, he recognized in this process a very valuable adjunct to any gas-works. It had the advantage that they could begin making gas within five hours of starting the plant; and as a stand-by, there was nothing to compare with it. In large works, in particular, he thought it had become a *sine quâ non*. He agreed with all the advantages Mr. Milne had enumerated. They could enrich the gas to any extent. He remembered some years ago, when he was considering the adoption of water-gas plant, he had Mr. Humphreys at his place, and discussed the matter with him. It was proposed to supply gas of 27-candle power. His difficulty was how to obtain this. Mr. Humphreys assured him that he could quite well make 27 or 28 candle gas. He was still sceptical as to his being able to make the gas permanent. However, he had learned since that it was quite a practical operation. According to modern systems of manufacture, there were very few towns in which gas of over 20 candles was supplied; and therefore they were come to an epoch in their work which would enable them to supply gas of this kind, and with great advantage. They were behind their English neighbours in taking up any processes of this sort; but he thought that, in Scotland, where they were lowering the standard of their gas, the time had come when they could with advantage adopt such a system as this.

Mr. Alex. Wilson (Glasgow) said that they tried carburetted water-gas plant some years ago, and compared it with their coal-gas manufacture; and they found that the water gas was costly, as compared with what they could make coal gas for. They discarded the water-gas plant. The holder room in Glasgow was so ample that they did not feel the necessity for having it as a stand-by. But the time might come when they might find it advisable—although even now he did not think it advisable—to put down plant and make carburetted water gas, though it might be at a greater cost than they could manufacture coal gas.

Mr. W. J. Smith (Carlisle) asked Mr. Milne to state the class of oil he used, and also the method of determining the illuminating power of the gas. It was somewhat of a mistake to think that carburetted water-gas plant was a very good stand-by, because, with inverted burners they had to deal with, and the necessity for a constant specific gravity, the variations of water gas made it not suitable.

Mr. Milne, in replying on the discussion, considered the remarks made by Mr. Yuill had been corroborated by what he had already said. He did not think there was anything which called for reply. In regard to Mr. Robertson's question as to the cost of purification, he must admit that, on the face of it, it would appear that there was something wrong. Nevertheless, it was a fact that there was only about one-fifth of the sulphur in the carburetted water gas that there was in coal gas. If they were to leave the carbonic acid in the gas, they could use oxide alone, and reduce the cost of purification to considerably under the cost for coal gas; but they had to remove the carbonic acid, or add a further proportion of oil to compensate for the loss of illuminating power which they would have if there were over 5 per cent. of carbonic acid. It was the removal of the carbonic acid which raised the cost of purification. It might be, also, that their system of purifiers was somewhat against the purifying of the gas economically. He believed it would have been better to have had two sets of purifiers—one for the removal of the sulphuretted hydrogen, and a separate set of boxes for the removal of the carbonic acid. However, he expected to be able to reduce the purification costs; and if they could get it down to about ¾d. per 1000 cubic feet, he would be quite satisfied. But he believed he would have a better system of purification if he had a separate series of boxes. He thanked Mr. Hislop for his remarks on the paper. It was now an accepted fact that carburetted water gas of 28, or even 30, candle power could be made perfectly permanent. Mr. Smith wanted to know how the gas was tested. He had a photometer for the testing of the carburetted water gas. He led a pipe specially from the gasholder to this particular photometer; and the gas was tested by the "Metropolitan" No. 2 burner. They would get nothing like the same efficiency if they tested with a flat-flame burner. Possibly the No. 2 burner was more nicely adjusted. While the statement of 7·46 candles per gallon of oil per 1000 cubic feet might appear to be high, he could confidently assure them that he had got higher results than this with the plant; but this was the average. While it would pay them to use carburetted water-gas plant at Aberdeen, he admitted that it might not pay some of the members who were situated at the pit mouth. They must bear in mind the long railway carriage they had. Probably they were paying 5s. or 6s. per ton more than others, on account of carriage; and while it paid them in remote parts, he did not say it would pay everyone to introduce carburetted water-gas plant. While the results satisfied him, they must remember that he was in a different position, geographically, from most of the members.

THE LATEST PRACTICE IN HORIZONTAL RETORT-SETTINGS.

By William Wilson, of Falkirk.

[A Paper read before the North British Association of Gas Managers.]

It may seem a little out of place to talk of horizontal retorts at the present time, when all the world is concerned with the perfecting of the various systems of vertical retorts; but I offer no apologies, as there may be not a few members of the North British Association who are similarly placed to myself—having charge of an over-capitalized concern, whose policy it is to "mark time" until some of the monetary burden is wiped off, and who meantime cannot face the scrapping of comparatively new plant representing thousands of pounds of capital value, and thereby burn their boats and plunge into the struggle for vertical retort supremacy. To members who may be suffering in the winter time from shortage of retort power, I would direct my description of how the difficulty was faced in Falkirk.

During the winter of 1907-08, all available retorts were at work; and as the demand for gas had shown annual increases for the previous three years of 10, 14, and 14 per cent., it was deemed too risky to try to weather another winter with the existing retorts, even supposing they were all in good order. The question, therefore, presented itself of how best to increase the retort-power or gas-producing power. The introduction of a water-gas plant was not considered, as we have a good market for coke and ample holder accommodation. To duplicate the existing retort-house, with coal-store and coal-handling plant and stoking-machinery, &c., would cost £18,500. This placed that project out of the count; and verticals were at that time more or less in the Patent Office. I, therefore, considered how best to increase the number of retorts without altering the existing retort-house and machinery. The only way, of course, was to alter the settings and add another tier of retorts.

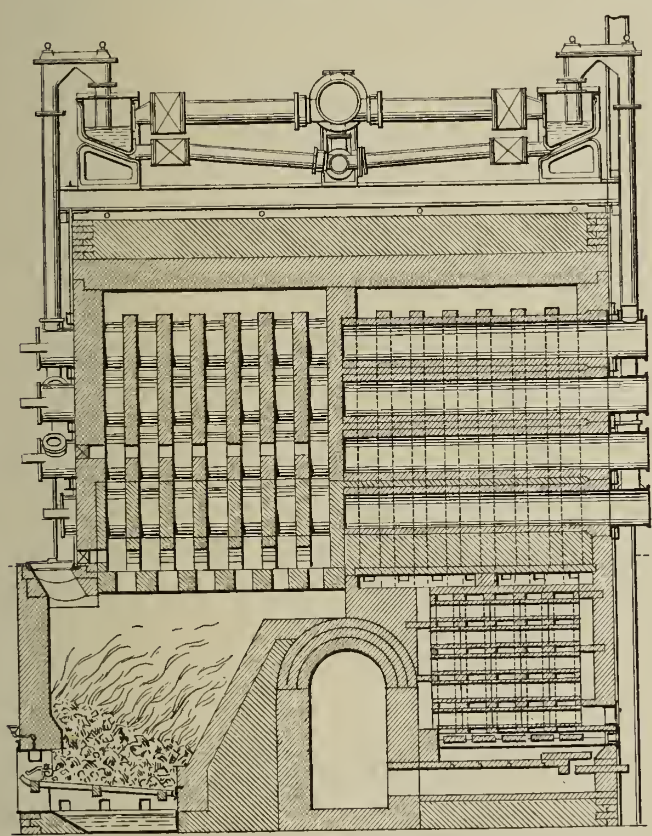
After fully considering the existing conditions of retort-bench settings, ironwork, and machinery, and after visiting Glasgow and Dundee to see settings of twelves in operation there, I decided in favour of adopting similar settings. The Falkirk settings differ somewhat from either of these, in that they have 20 feet through retorts heated by internal producers at one side only. The Dundee settings have stop-ended retorts, 10 feet long, with internal producers on each side; the Glasgow settings have stop-ended retorts with external "Jumbo" producers.

A description of the original settings may not be out of place here. They were of eight retorts, 20 feet through and 22 inches by 16 inches, having producers at one side only, and each retort having two ascension pipes—there being a hydraulic main on each side of the bench. There were twelve ovens; making a total of 96 retorts. The retorts are charged and discharged by Dempster's well-known machines, electrically driven, one projector charger, and one telescopic pusher or discharger.

The method of conversion was this: Seven old settings of eights had the mouthpieces, ascension-pipes, bridge-pipes, and retorts removed as far as the top of the regenerators, which on examination were found to be in good order after working three winters. It was therefore decided to allow them to remain. The pier-walls between the settings were then strutted to each other, and the arches removed. The pier-walls were then heightened, and new elliptical arches were formed. No alterations were required to the bench-binders or the hydraulic main, &c., as owing to a wise forethought on the part of the late Mr. William M'Crae, there was ample room to carry up the brickwork without disturbing them. The end bench-binders only had to be lengthened 18 inches, by a short length of rolled steel joist of the same section, which was secured by fish-plates and bolts. The arch oven, producer, and producer-gas flue were lowered a little, and the size of the producer was enlarged by making it project 27 inches. This projection allowed a much better feeding arrangement for the producers than formerly. Ten retorts out of twelve are now available for the furnaces, if necessary, instead of four out of eight. The advantages of a regular supply of fuel to the producers are well known.

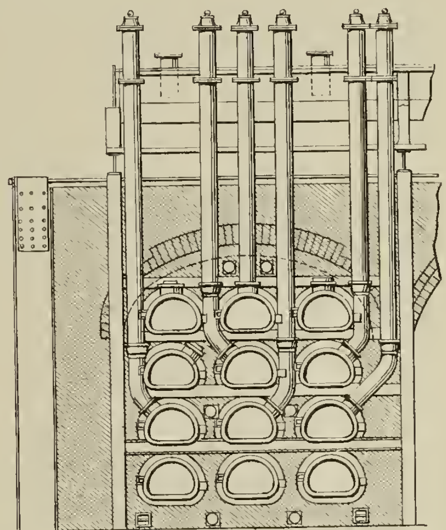
The original combustion chamber was replaced by a retort, and two small combustion chambers were formed, as shown in the drawing. The combustion chambers are made entirely with Yorkshire Silica bricks and also the crown of the main producer gas-flue. The cross walls of the settings are formed of the same materials between the centre row of the retorts and the side rows half-way up. No trouble has been experienced through using this material, which has proved highly satisfactory. The bottom corners of the first two tiers of retorts next the combustion chambers are formed square outside, after the Dundee pattern. The retorts have now one ascension pipe only; the pipes being carried up on alternate sides, as shown. Having now a smaller number of ascension-pipes than formerly, we have, of course, left over four spare bridges from each oven and four idle dip-pipes. The dip-pipes were closed with a blind-flange, and the idle ascension pipe-faucets on the original mouthpieces were plugged with a cast-iron plug. Eight new mouthpieces were required on each oven, which were made, where possible, without any faucets. The bottom mouthpieces on the producer side (having no ascension-pipes) are made as short as possible. This enables the bottom centre retort to be discharged into the producer without any feeding device whatever.

The machines were easily altered to suit the elevation of the

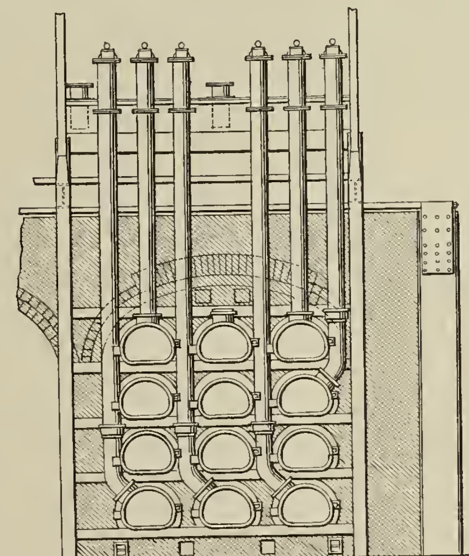


Section through Furnace. Section through Regenerator.

Retort-Bench at the Falkirk Corporation Gas-Works.



Elevation of Retort-Bench—Machine Side.



Elevation of Retort-Bench—Furnace Side.

retorts. In the case of the charging machine, no alteration was made to the frame, as it was only necessary to remove a small coal-weighing hopper to allow the cage carrying the charger to travel 2 feet higher. In the case of the pusher, however, the frame had to be extended. The cost of the alteration to the machines was £235.

While talking of the machines, I might mention that opportunity was taken to effect one or two improvements while the machines were under alteration. The most important of these was on the pusher, where one motor either hoists or lowers or operates the pusher—these operations being effected at will by means of jaw-clutches. Friction clutches were substituted, and two wire ropes were introduced for operating the internal portion of the telescopic ram, in place of the previous single rope. These alterations have greatly increased the life of the wire ropes. The ropes for the internal ram now discharge coke from 3000 tons of coal without renewal. They cost 17s. 6d. each, while the ropes on the external ram have been in use for twelve months, and have handled coke from 22,000 tons of coal.

In the case of the charging-machine, the discarding of the small hopper for weighing the charges was at first thought to be a serious disadvantage; but we now find a marked improvement in the evenness of the charges without it, for whereas previously the weighed charge had to pass through the charger whether the retort was full or not, the operator has now a pedal-operated clutch-driven band-feeding arrangement whereby he can stop the feed at any time. He has also an arrangement of two mirrors, which enables him to see right into the retort while standing behind the charger. The weight of the charges is got by noting the numbers and weights of the waggons elevated daily and taking stock in the overhead hoppers.

To return to the settings of twelves. No trouble has been experienced in the heating of these ovens, except at first when they were rather dull half way through. This was overcome by adjusting the dampers on the first or top travel of the regenerator flue. The bottom centre retort, being situated in the centre of the heat zone, is inclined to over-heat; and to counteract this, it is charged more frequently. The ascension pipe from this retort is the only one which has given trouble by choking. At first the settings were worked with 5½ cwt. charges at four hours intervals; but now, in order to save labour, we work 8 cwt. charges at eight hours. The bottom centre retorts being charged every four hours when the stock of gas is low, by increasing the heats, the retorts work off 8 cwt. charges in six hours. The fuel consumption in the producers has been carefully recorded. It runs from 22 to 25 per cent. of the total coke produced, and compares with 25 to 33 per cent. for settings of eights with the same regenerators.

The regenerators on six ovens are the usual zig-zag flue type, having Dempster's patent corrugated tiles in the partition walls between the second air-flue and waste-gas flue. The draught required on these settings in the last travel of the waste-gas flue next the dampers is 3-10ths to 4½-10ths water gauge. On oven No. 7, where the original regenerators could not be re-utilized, they were replaced by Brooks's patent regenerators; and on this oven the draught required is from 2-10ths to 3-10ths.

There are two marked advantages in the use of these settings so far as the labour of the stokers is concerned. They have only half the number of ascension-pipes to attend to and fewer furnaces.

As I have already stated, the retort-house into the coal-store and machinery and the bench of 96 retorts cost £18,500, or £192 14s. per retort, or £96 7s. per mouthpiece. The cost of the above-described alterations, including brickwork and alteration to the machines, was £3044 10s. This was allocated as follows:—

Capital	£1169 10 0
Revenue	1875 0 0
	£3044 10 0

The reason for charging £1875 against revenue was that eight retorts in each of the seven ovens would have been renewed in any case; so that roughly two-thirds of the cost of the brickwork is charged against revenue. The remaining one-third, and the cost of the alterations to the machines, make up the £1169 10s. The increased number of retorts was 28; giving a capital expenditure per retort of £41 15s. 4d., or £20 17s. 8d. per mouthpiece.

There is one other matter I should like to touch upon before concluding, that is the question of overhead coal-storage. As originally arranged, we had at Falkirk two overhead storage hoppers for supplying the machines. These hoppers each held 10 tons. This limited storage necessitated two elevator men on twelve-hour shifts in the summer time and three men on eight-hour shifts in the winter time intermittently supplying the hoppers.

While carrying out the foregoing alterations to the settings of twelves, I recommended the erection of a continuous hopper extending the full length of the retort-bench, which, with the extended conveyor, cost £775. The total capacity of the overhead hoppers is now 120 tons. The interest and sinking fund on this capital expenditure, at 5 per cent., is £38 15s.; and the introduction of the new hopper enables us to dispense with the services of two elevator men throughout the year—effecting a saving in wages of £146. The elevating is done during the summer months now in the spare time of the locomotive driver and shunter, and there is one elevator man required in the winter time. Our coal-elevator will handle 25 tons per hour.

There are several other advantages resulting from the introduction of this hopper. First, there are no waggons or machinery moving during the night; therefore, less risk of accidents. Second, there is much longer time available for adjustments and repairs to the elevating plant than formerly.

I am not sure whether the introduction of overhead hoppers would result in such a marked saving in very large works; but they have proved themselves to be of very great advantage at Falkirk, and the question of their introduction into other medium-sized works may be well worth consideration by the members present.

Discussion.

Mr. A. Smith (Tradeston) said he had retort-settings of twelves, in the Tradeston works, and also eights, but, of course, with stop-ends; and consequently the method of working them was altogether different from that of Mr. Wilson. Their charges were four-hour, both with the eights and the twelves. As to the filling of the producers, was it only the centre retort that the producer was charged from? Mr. Wilson's was certainly a very novel arrangement.

Mr. G. R. Hislop (Paisley) had had no experience with so many retorts set in one oven; but if Mr. Wilson realized what he had put before them, he had accomplished a very important advance in the setting of retorts, so far as regarded economy of space. If he were able to maintain the heat, upon settings of twelve retorts, which they obtained with settings of eight, it would be a very important advance in economy of both fuel and space. It would certainly be of very great advantage where space was valuable. If Mr. Wilson could sustain, in practice, the statements he had made in regard to the settings, he had no doubt that many would consider the propriety of increasing the capacity of their works in this way. He had no doubt that, in time, they might attempt it at Paisley, because they had not much land to spare, and he contemplated getting relief by the introduction of carburetted water gas. He congratulated Mr. Wilson upon his inventive genius. He had done exceedingly well in the matter of ascension-pipes, in taking one half off the one side and the other half off the other side. He wished that Mr. Wilson would have success in what he had attempted, and hoped to hear more about the subject in the future.

Mr. S. Milne (Aberdeen) wished to ask Mr. Wilson one or two questions. In the first place, had he a coke-conveyor? He thought he remarked that, in discharging the coke, the discharger was placed on the side opposite from the generator, so that the retorts were discharged practically direct into the generator; and to facilitate this, he reduced the length of the retort to 9 feet. If he had a coke-conveyor, it would appear that the conveyor would work with greater freedom on the opposite side of the bench. The only difficulty, he supposed, would be the filling of the generator. If there was a coke-conveyor, where was it situated? Was the charging-machine on the opposite side to the drawing-machine, or were they both operated from the one side?

Mr. Wilson, in reply to Mr. Smith, said that he used none of the side retorts in the charging of the producer. As a rule, the contents of the centre bottom retorts went into the furnace every time. The contents of the side retorts all went to the yard; and in many cases the top centre retorts went to the yard also. The producer did not extend to the whole width of the oven; it was only a little bit beyond the furnace. They had a coke-conveyor; but it was not in action, owing to subsidence in the floor, and even in the bench itself. This subsidence made the coke-conveyor subject to enormous wear and tear—so much so that, when they were altering the bench, they decided to do without it, and they ran the coke out at present in bogeys. They might revert to the coke-conveyor when they were satisfied that the bench was all right.

Absorption of Sulphur by Wall Plaster.—In a recent number of "Progressive Age," reference was made to some experiments carried out in the Arthur D. Little Laboratory of Engineering Chemistry at Boston (Mass.), in regard to the quantity of sulphur gases introduced into rooms through the burning of illuminating gas. A room was arranged for a series of tests by rendering it practically air-tight, and installing within it fans for stirring up the air and exhausting it at a rate to maintain the desired degree of ventilation. The room was plastered, as is usual in dwelling-houses, and the walls were papered. The object of the experiments was to find out to what extent the burning of illuminating gas increases the amount of sulphur gases while ventilation is maintained at the usual standard of air purity; and they showed that sulphur was absorbed by the plaster. After experiments had been made with good and with poor ventilation, and with a comparatively large and a small percentage of sulphur dioxide, due to burning gas, it was evident that the greater the sulphur dioxide content the faster it was absorbed by the plaster. The ceiling of the room was then papered, and the experiments repeated under the same conditions of ventilation. It was found that while the paper reduced somewhat the effectiveness of the plaster in absorbing the sulphur, it was sufficiently porous to interfere but little with the reaction between plaster and sulphur. Analyses of plaster scraped from the surface and near the lath, together with calculations, show that sulphur is quickly absorbed at the surface, and that the plaster on a 10 ft. by 18 ft. ceiling will neutralize for several centuries the sulphur coming from the burning of 25 cubic feet of gas per day, when the gas contains 20 grains of sulphur per 100 cubic feet.

THE "H.B." PATENT PUMP-VALVE.

The characteristics which are most desirable in connection with a pump-valve are claimed to be embraced in Witting's patent "H.B." valve, orders for which have already been received from certain gas and water works. This automatic device, which is intended for use with pumps, pumping and blowing engines, compressors, &c., has been designed with the object of greatly increasing the capacity of these appliances (by rendering a greater speed of working practicable), and at the same time ensuring absolutely silent working. It is remarked by Messrs. Witting Bros., Limited, of No. 49, Cannon Street, E.C. (who are marketing the valve) that there is general recognition of the fact that one of the most troublesome limitations to the speed at which it is practicable to run reciprocating pumps is in respect of their valves, which should be of light construction to open smartly and afford a free and unimpeded water-passage, and must also close with equal promptness. If the moving parts are heavy, their inertia causes throttling at opening, and hammering at closing. These difficulties, they say, have been overcome in the "H.B." type of valve, which, owing to the lightness of the moving parts, will operate promptly, even at the highest speed of reciprocating pumps.

The requirements which the "H.B." valve has been designed to meet are that: (1) The closing portion should be so arranged that its movement is not impeded by the flow of the fluid passing through; (2) it should be as light as possible; and (3) it should have a small spring load, and thereby a low resistance.

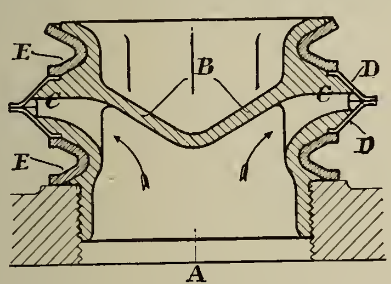


Fig. 1.—Section of "H.B." Valve.

In explanation of the invention, it may be remarked that the fluid to be raised enters at A (fig. 1) into a fixed body B; the latter being shaped in such a manner as to lead the current gently aside, and to allow the water to leave the body at the outer periphery through portholes C radially towards all sides. The moveable closing medium consists of two thin lip-rings D, made of brass or steel, which cover the portholes when the valve is closed. The outer edges or lips press against each other; and the conical part fits the body of the valve. The necessary closing force is afforded by the V-shaped rubber rings E, laid in corresponding grooves of the body, which press the metal rings against each other.


Fig. 2.—"H.B." Valve Open.

As to the fulfilment of the conditions aimed at by the inventors, it is pointed out that by the construction adopted the fluid is brought practically free of friction and contraction from the axial into the radial direction by means of the fixed body, and suffers no further variation in direction when going through the lips of the metal rings. By closing the valve, the fluid is easily diverted from the outer edges of the metal rings; while in disc or ring valves the fluid rising out of the seat must be forcibly restrained. The two metal rings which form the moveable closing medium are not heavy; they are only exposed to the water pressure over the narrow port-holes of the body; and they are extremely stiff, owing to their conical shape. Under these conditions, a very low spring power suffices to close the valve at the proper time, even in the highest speed pumps. The spring power is simply obtained by the annular rubber rings; and owing to the weak springs, the valve opens extremely easily, and thereby offers the least resistance to the fluid flow, by which considerable saving is obtained in the necessary pump work.

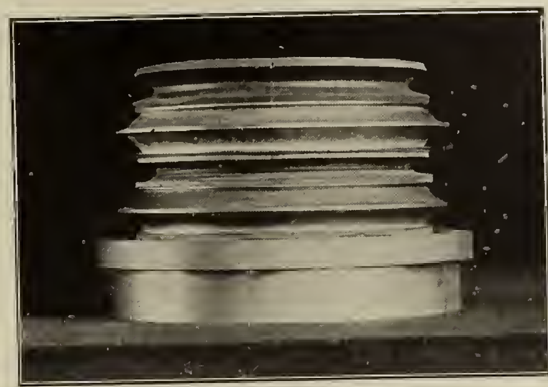


Fig. 3.—"H.B." Valve Closed.

It is pointed out by Messrs. Witting that it is possible, by retaining the principle and working method of the "H.B." valve, to make the constructional form in many ways, so as to adapt the appliance to all circumstances. "H.B." valves of several stages consist of single units laid loosely one upon the other, and held together by means of a cover or bolt. Thus special packing is unnecessary, as the rubber rings act as packing, as well as for springs. The metal rings—the parts subject to wear and tear—can be replaced easily and cheaply, no mechanical appliances or skilled workmen being required. The valves can be fitted to any existing pump; and one of the advantages claimed for them is that jamming is impossible. In the case of hot-water pumps, blowing engines, and compressors, the rubber rings are replaced by metal springs.

IGNITION TEMPERATURES OF GASES.

In the "Journal" for the 30th of March (p. 907), we reproduced from the "Chemical News" an abstract of a paper on the above subject prepared for the Chemical Society by Professor Harold B. Dixon and Mr. H. F. Coward. The full text of the paper has now been published in the "Transactions" of the Society, and from a reprint forwarded to us by the authors we make the following extract.

The determination of the ignition temperatures of inflammable gases has been attempted by numerous investigators in various ways. The results obtained are widely divergent, not only for separate series of observations, but to a smaller extent in each series. The results of Sir Humphrey Davy (1816) are now interesting only from an historical point of view. He found that hydrogen and hydrogen sulphide inflamed when mixed with air at "the lowest visible heat of iron and charcoal." Ethylene and carbon monoxide were fired by both charcoal and iron heated to rednesss. Methane was not inflamed by an iron rod at "the highest degree of red heat, and the common degree of white heat;" but an iron rod "in brilliant combustion" succeeded.

Bunsen determined the limiting dilution of electrolytic gas with hydrogen, oxygen, and carbon dioxide beyond which the mixture was no longer inflammable. The temperature of the flame which travelled through the mixtures that were only just inflammable was calculated. This he regarded with some hesitation in the first edition of the "Gasometrische Methoden," as the ignition temperature of hydrogen. In the second edition he quoted only the corrected number for the oxygen dilution experiments as the ignition temperature—viz., 743·6°. Bunsen's method is open to two main objections—first, the fact that electrolytic gas alone does not ignite with an ordinary spark below 70 mm. pressure; and, secondly, the results obtained with different diluents are widely discordant, as 2116°, 1760°, and 857° are given for the ignition-points of hydrogen when carbon dioxide, hydrogen, and oxygen respectively are used as diluents.

More recent investigations may be classed into three main groups according to the experimental conditions: (1) A bulb containing the mixed gases was plunged into a bath at constant temperature; (2) a stream of the mixed gases was passed through a tube in a bath which was being gradually heated up; and (3) the adiabatic compression, just sufficient to cause ignition, was used to calculate the temperature of the mixture at the ignition-point. The results obtained by these methods for hydrogen and oxygen are collected in the following table:—

	Observers.	Ignition Temperatures.
(1)	V. Meyer, Krause, Askenasy	518°—606°
	Emich	589 571—608 (with excess of O) 575—607 (with excess of H)
(2)	Mallard and Le Chatelier	550
	Bodenstein	653—710
	Mitscherlich	674
	V. Meyer and Freyer	700
	Gautier and Helier	840
	Helier	845
(3)	Falk	540 ($2H_2 + O_2$) 514 ($H_2 + O_2$) 530 ($H_2 + 2O_2$)

It is to be noted that when the gases were heated in sealed bulbs

the pressure at the ignition-point was roughly three times the initial pressure; and when the gases were fired by adiabatic compression the pressure at the ignition-point was roughly 39 times the initial pressure.

The observations recorded for gases other than hydrogen are very few. Mallard and Le Chatelier found, by passing different mixtures of carbon monoxide and oxygen or air through a heated tube, an ignition temperature of 630° to 680°. Dilution with carbon dioxide raised the ignition temperature to 695° to 725°. These investigators also gave 600° to 660° as the ignition temperature of methane.

V. Meyer and Freyer obtained the following limiting values for ignition temperatures:—

Mixture.	Ignition Temperature of Free Current of Gas.	Ignition Temperature of Gas in Closed Bulb.
Methane and oxygen	650°—730°	606°—650°
Ethane and oxygen	606 —650	530 —606
Ethylene and oxygen	606 —650	530 —606
Carbon monoxide and oxygen	650 —730	650 —730
Hydrogen sulphide and oxygen	315 —320	250 —270
Hydrogen and chlorine	430 —440	240 —270

V. Meyer and Münch employed rather later the following improved method. The explosive mixture was passed through a capillary tube to the bottom of a small glass vessel inserted in the bulb of an air thermometer. When the mixture inflamed, the air of the thermometer bulb was displaced by hydrogen chloride and measured over water. This gave the temperature of ignition. The following are the results obtained:—

Mixture.	Ignition Temperature.	
Hydrogen and oxygen	620°—680°	
Carbon monoxide and oxygen	Combined quietly.	
Hydrogen sulphide and oxygen	Combined quietly.	
Methane and oxygen	656 —678°	
Ethane and oxygen	605 —622	Three experiments each.
Ethylene and oxygen	577 —590	
Acetylene and oxygen	509 —515	
Propane and oxygen	545 —548	
Propylene and oxygen	497 —511	
*iso*Butane and oxygen	545 —550	
*iso*Butylene and oxygen	537 —548	
Coal gas and oxygen	647 —649	

The chief source of disagreement in the preceding results is probably to be found in the influence of surface action. Thus the results of Helier and of Gautier and Helier were obtained by passing electrolytic gas through a tube packed with pieces of glazed porcelain—an experimental method which increased the slow surface combination enormously, and resulted in an ignition temperature nearly 300° higher than that found by Mallard and Le Chatelier.

In the method of adiabatic compression used by Falk at Professor Nernst's suggestion, fourteen experiments with electrolytic gas gave numbers from 518° to 569°, with a mean of 540°. In these experiments, ignition occurred under some 35 to 70 atmospheres pressure—a very different condition from that of previous experiments. Our experiments show that the ignition-point of electrolytic gas falls with increase of pressure. The present set of experiments is based on the definition of ignition-temperature as that temperature to which the gases must be separately heated so that when brought into contact they will inflame immediately. The method used by us was designed by Professor Dixon in 1903, the first apparatus being constructed by Mr. G. W. A. Foster, B.Sc. An atmosphere of oxygen or air passed slowly upwards through a large porcelain tube, the temperature of which could be gradually raised by means of an electric current traversing a close spiral of platinum wire wound round the outside of the tube. The inflammable gas was led up a narrow tube fixed in the axis of the larger porcelain one, so that the gases were heated to the highest temperature of the tube before they came into contact. The temperature of the gas was recorded by a thermo-junction inserted just below the orifice of the narrow inner tube. The flowing current of gas ensured the supply of fresh hot gas, and the removal of products of slow combustion. This arrangement also enabled the effect of surface influence to be minimized. Working with different tubes, we found that a constant ignition point was obtained when both the diameter of the outer tube and the rate of the stream of combustible gas issuing through the orifice surpassed a certain minimum value. With an outer tube of 45 mm. diameter and an orifice of 1 mm. diameter, the stream of hydrogen had to be passed at a rate exceeding 9 c.c. per minute to give a constant ignition temperature. The same constant was reached in a wider tube with a faster flow of hydrogen.

That the ignition temperature of a jet of hydrogen should fall with an increase in the diameter of the outer tube containing the oxygen, and for a given diameter of outer tube should fall with an increase in the speed of the jet, seemed explicable on two hypotheses:

I.—It might be supposed that a stream of hydrogen escaping very slowly into an atmosphere of oxygen would diffuse more rapidly into the oxygen than a quicker stream rising in an unbroken cylinder for some distance above the orifice. In the diffused gases, quiet combustion might begin, and the steam so formed, diluting the mixture, might raise the temperature of ignition of the residue. The difficulties of such an explanation are twofold. The quiet combustion would heat the mixture and tend to lower rather than raise the apparent ignition-point. And, secondly, when the hydrogen was diluted with nitrogen, or with steam, or with oxygen (which would form steam just before the gas issued from the orifice), no raising of the ignition-point was observed. Similarly, the substitution of air for oxygen in the outer tube made no difference in the ignition-point. The "dilution" hypothesis is therefore untenable.

II.—Since the gases inflame at a lower temperature when they are removed farther from the hot surfaces of the outer tube and from the hot mouth of the inner tube, these hot surfaces must retard the chemical action. Now, it has been shown by the photographic analysis of explosion flames that, when an explosive mixture is ignited in a tube by a small spark, the gases continue to burn with a nearly constant intensity for a comparatively long period, so long as they are undisturbed by compression waves. When a compression wave strikes such a burning mixture, the rapidity of combustion is greatly increased. In this way it can be shown that in a freshly ignited flame of electrolytic gas the number of "chemically fruitful" collisions between hydrogen and oxygen molecules is only a small fraction of the total collisions. On the other hand, from Maxwell's law of the distribution of speeds among gaseous molecules, we find that about 3 per cent. of the molecules have a speed twice as great as the "most probable speed." In a gaseous mixture the mean temperature of which is approaching the ignition-point, chemical action would begin among these more rapidly moving molecules. Now, the presence of a solid body at the mean temperature of the gas would tend to equalize the speed of the molecules coming into contact with it, accelerating the slow but checking the rapidly moving. The hot walls would therefore hinder the initial chemical combustion, due to collisions "out in the open," and *pro tanto* raise the ignition-point. But the solid wall would also take up the heat from such steam molecules as were formed on or near its surface, and prevent them from communicating their energy to the unburnt gases round them.

It may be assumed that the width of the outer tube chiefly affects the movements of the oxygen molecules, while the rapidity of the stream of hydrogen affects the movements both of the hydrogen and oxygen molecules as they diffuse into each other round the orifice of the inner tube. This hypothesis seems to account for the observations, and also to explain why, *cæteris paribus*, a larger orifice, by offering a less surface to the mixed gases, gives a lower ignition-point when the jet is issuing comparatively slowly.

The results we have obtained for the ignition temperatures of gases at normal pressure may be summarized thus:

Gas.	Ignition Temperature in Oxygen. Between.	Ignition Temperature in Oxygen. Mean.	Ignition Temperature in Air. Between.	Ignition Temperature in Air. Mean.
Hydrogen	580° and 590°	585°	580° and 590°	585°
Carb. mon. (moist)	637 ,, 658	650	644 ,, 658	651
Cyanogen	803 ,, 818	811	850 ,, 862	856
Ethylene	500 ,, 519	510	542 ,, 547	543
Acetylene	416 ,, 440	428	406 ,, 440	429
Hydrogen sulphide	220 ,, 235	227	346 ,, 379	364
Methane	556 ,, 700	—	650 ,, 750	—
Ethane	520 ,, 630	—	520 ,, 630	—
Propane	490 ,, 570			
Ammonia	700 ,, 860			

In the remainder of the paper, the authors deal in detail with the various experiments they carried out.

Gas Companies' Accounts for 1908.—We have received from Messrs. John Allan and Co. the "'Gas World' Analyses of Gas Companies' Accounts for 1908." These accounts, as our readers may remember, are now issued separately from those of the local authorities. The accounts of 55 gas companies are analyzed; the results occupying two large linen-backed sheets. On the left-hand one will be found particulars relating to the coal carbonized, the percentage of carburetted water gas produced, the quantity of gas made, sold, and unaccounted for, the yield of residuals, statistics of revenue, &c.; while on the right-hand sheet are given the distribution and management charges, bad debts, net cost of gas, mileage of mains, number of consumers and public lamps, total capital and the capital per ton and per 1000 cubic feet, and the reserve funds. The book is similar in appearance to its predecessors, and the price is 10s. 6d. net.

Coal-Tar Dyestuffs in the United States.—This subject was dealt with by Herr J. F. Schoellkopf at the recent International Congress of Applied Chemistry. According to an abstract of his communication in the "Journal of the Society of Chemical Industry," the retarded growth of the coal-tar dyestuff industry in the United States, which, prior to the Tariff Act of 1883, was in a flourishing condition, is considered to be due to the unfavourable tariff legislation of the year named, when no less than five distinct factories were removed. The Tariff Act of 1897, however, made progress in the United States possible; and in the ten years next succeeding, the industry made greater strides than it had in the preceding thirty years. With a prospect of better tariff protection and of suitable modification of the patent laws, combined with a renewed supply of suitable coal-tar hydrocarbons to be obtained by the new systems of coking coal now being adopted, it seems not at all impossible that the United States may, in course of time, become exporters instead of importers of these dyestuffs. The total output of them in the United States is placed at 4,000,000 lbs., valued at considerably more than $1,000,000; and for the last ten years the rate of increase in domestic production has been about twice as great as that of the importations.

THE WORKING EFFICIENCY OF THE HIGH-PRESSURE GAS-PLANT.

By Alexander Waddell, of Dunfermline.

[A Paper read before the North British Association of Gas Managers.]

At last year's meeting, the author gave a few notes on high-pressure gas supply for a district 144 feet below the gas-works, and extending to $4\frac{1}{2}$ miles therefrom. The supply required per annum was estimated at $2\frac{1}{2}$ million cubic feet within the first three years—probably rising to 20 millions within ten years. It was noted that to deliver gas by the low-pressure system 144 feet below the works and holder level, would have necessitated far larger piping all round, on account of the pressure at the district supplied being so much under that at the holder. Consequently, the cost of gas would have been increased, making it unfavourable alike to consumer and supplier.

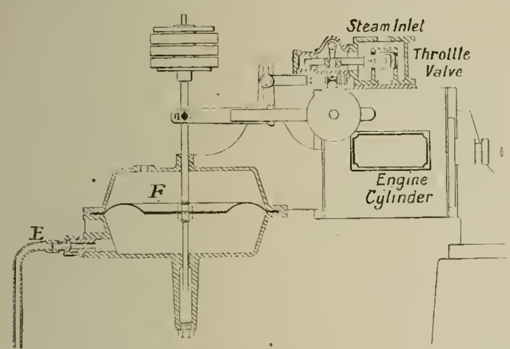


Fig. 1.—Diaphragm Governor, Operating the Throttle-Valve of the Steam-Engine.

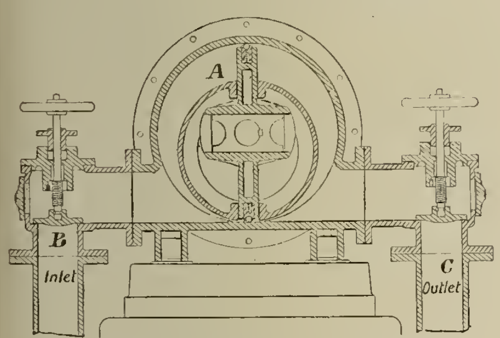


Fig. 2.—Sectional Elevation of Compressor.

These were among the principal reasons given for adopting high-pressure transmission just as it had been up to date, but with the difference that, instead of having the compressor regulated by an attendant in the usual way to pass a certain unknown quantity even comparatively, and maintain a certain pressure, neither had any relation to the unknown and the constantly varying demand of which even the attendant was entirely without guidance. The author proposed, and claims that he was the first to propose, to return a pressure from within the supply pipe so as to automatically regulate the compressor and maintain a predetermined and always sufficient, but not excessive, minimum pressure at the district to be supplied, however much the demand might vary—thus securing the greatest possible efficiency of compressor and piping with the minimum size of plant and total cost.

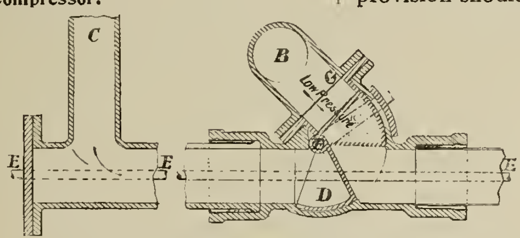


Fig. 3.—High-Pressure Automatic Three-Way Valve.

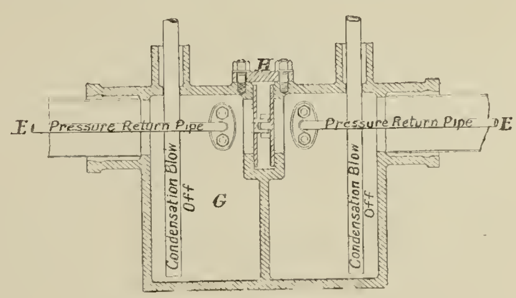


Fig. 4.—Patent Inspection Test-Box.

The plant was started last October, and has worked for the past nine months in a way that is completely satisfactory. The drawings show a side view of the principal portions of the plant erected at Dunfermline. A is the compressor; B the inlet to the compressor; C the outlet of the compressor; D an automatic high-pressure safety bye-pass valve (referred to later); E the small return pipe by means of which the pressure away at the area of supply is transmitted to the apparatus for controlling the speed of the compressing plant; F a diaphragm controlling apparatus, the function of which is to automatically regulate the speed of the compressor in order to maintain a uniform (and predetermined) pressure in the area of supply, and which pressure is introduced to the underside of the diaphragm; G is a combination trap, test, and inspection box, &c.

The plant consists of a vessel containing a horizontal leather diaphragm, on top of which, and fixed thereto, is a metal plate and vertical spindle. This spindle is guided in, and extended through, the top cover of the vessel, and terminates in a weight carrier. The weights placed on this carrier balance the pressure of the gas which is on the underside of the diaphragm, in whichever position it may be occupying at the moment. The vertical movement of the diaphragm and spindle is transmitted to the lever of a steam throttle-valve on the engine by a suitable system of levers.

To follow the controlling action of the apparatus, let us assume that weights have been placed over the diaphragm requiring 6 inches of pressure under it to lift it. On starting the engine, the result must be that the pipes will be filled with gas at a pressure rising to 6 inches (at the far end of the district to be supplied). This pressure is conveyed to underneath the leather diaphragm and lifts it; the diaphragm in turn rising and controlling the steam throttle-valve and compressor so as not to allow more than the predetermined 6 inches of pressure on the one hand. On the other hand, when the diaphragm tends to fall, more steam is supplied to the engine—causing the compressor to give a pressure not less than the 6 inches predetermined; so that a constant balance of weight over and pressure under the diaphragm must be obtained so long as the compressor has power to do so. It governs not only the gas pressure in the district (as does a governor); it also governs the compressor. While the weight above and the pressure below are constant, it will be observed that the diaphragm must rise and fall in accordance with the steam required or the demand made for gas.

You may ask the following questions: (1) How does it work? (2) With what efficiency? (3) Is it reliable?

In regular working the pressure in the high-pressure main over 24 hours varies only about half-an-inch. During a temporary obstruction (probably naphthalene) which passed away as it came—leaving no definite indication of what it really was, though all water-traps were visited and found quite dry—I took a record of pressure on the supply district and found that it remained as usual, although the engine had to raise the pressure to 23 inches at the outlet of the compressor to do so. It will be evident to you that, although an obstruction should take place and be great enough to require the full power of the compressor with steam full on, the plant would still automatically maintain the minimum pressure in the supply district which it was set to give, and could only fail to do so on account of an accident or want of power of the compressor.

This result differs widely from what occurs when we depend on a stated maximum pressure at the outlet of the compressor or governor, and shows how the compressor and piping combine in this form of plant to render automatically the best possible service.

Another record of pressure taken when the cover H (fig. 4) was off—making an opening nearly equal to the area of the pipe—showed a fall of pressure of 8-10ths; and when another cover was put on, the pressure recovered itself.

These and other tests I have made are more severe than would take place in actual practice. The largest variation of pressure is from 7 to 8 inches, which is not at all excessive or such as would disturb the consumers, and is a smaller variation than is obtained with ordinary low-pressure distribution.

After the plant had been working for some time, it was felt that provision should be made against any breakdown or stoppage of the compressor; and, after considering all that was possible in this matter, the bye-pass valve D was designed to meet the following requirements: 1st. That it should have no water or other lute, as it will have to work with a pressure up to 20 lbs. or perhaps more. 2nd. That it should bye-pass the moment the initial pressure of the gasholder exceeds that at the outlet of the compressor. 3rd. That it should shut the bye-pass when the compressor was restarted. 4th. That it should not be subject to stick; and that it should be automatic and reliable in its action.

The design of valve shown is one suited for large-sized plants. C is the outlet pipe from the compressor to the supply district; and B, the bye-pass from the inlet to the outlet of the compressor. D is the moving part of the valve. It is box form; the side view being triangular (the front, not shown, is square). It is hinged at F, and the bearings are at G. The position it is shown in is that which it occupies with the compressor standing. The dotted lines show its position when the compressor is working. When the compressor starts, the first thing it must do is to raise the valve to where it is shown in dotted lines, shutting the bye-pass before any gas can pass to supply the district. This is not obtainable in a flap or plate valve, which would open partly when the compressor started, only to allow the gas to be pumped round from the outlet to the inlet of the pump, but would give no high-pressure delivery to the district. Another point is that the moving part is held up against a face (which is unlikely to get dirty or sticky) and out of the way when compression proceeds. Then it

has all its weight if necessary to enable it to fall and bye-pass, and the full power of the compressor to shut it against bye-passing and hold it there. Hence its reliability.

I have for inspection an enlargement to full size of some automatic records of tests made to show how the valve responds to any stoppage or breakdown of the engine and sudden changes in the consumption of gas. These pressure records, drawings, and descriptions show how the plant answers its purpose and with what efficiency and economy. In its working there has been no trouble; and it has given satisfaction to all concerned—including the consumers, although they pay considerably more per cubic foot for their gas than the people in Dunfermline. The author believes this is in no small part due to the somewhat higher and distinctly more uniform pressure that is obtainable than under ordinary circumstances.

Just one little difficulty in the erection of this plant may be noted. It was found after a large part of the block-tin tube was laid inside the supply pipe, that there were a number of small holes in it, owing to little pieces of hard parts in the metal which did not stretch like the rest of the pipe and as it was drawn into supply caused the holes. It was fortunate, therefore, that we were able to withdraw the tube at the combination water-trap, test, and inspection boxes, and to replace it with other tube with a minimum of trouble.

Discussion.

The President said they would remember that last year Mr. Waddell gave them a description of his plant. He was now in a position to speak of his actual results.

Mr. D. Vass (Airdrie) quite recently had brought before him a question regarding the supply of gas to a low-lying district in the town; and in view of what had been placed before them by Mr. Waddell, he went to Dunfermline and saw Mr. Waddell's plant. He was greatly satisfied with the manner of working it. He examined the plant minutely, and saw it under almost all the tests Mr. Waddell had described that day. The draining-off from the high-pressure main, which might, on special occasions, be due to the starting of gas-engines, was a feature of the working which struck him. The plant answered admirably to the call, and sent out a larger volume of gas to the outlying district. They required something of this sort to maintain a steady pressure in places where a gas-engine might be started at a time when they knew nothing at all about it. As the plant was used at Dunfermline, it at once sent out an extra supply of gas, without any man being near it at all. He understood that one of the difficulties Mr. Waddell had was with reference to the tube inside the main, and that he substituted a lead for a compo. pipe. He would like to know what Mr. Waddell would say about a malleable iron tube being put in, instead of lead, and just coupling-up near the inspection-boxes. Mr. Waddell's arrangement admirably answered the purpose for which it was put in. The valve described, particularly, worked very sweetly. He saw the engine stopped, and the valve fell immediately the pressure was taken off.

Mr. J. D. Keillor (Lochgelly) said there was one thing which he thought Mr. Waddell might have gone more fully into. That was the working costs—the costs of compression, maintenance, and so on. With regard to the bye-pass valve, he presumed it was patented, or that it was some idea of Mr. Waddell's own. He (Mr. Keillor) had a valve fixed on his plant, between the inlet to the blowers and the outlet of the blowers. It was an ordinary flap-valve, with the flap opening, of course, away from the inlet to the blowers. Immediately the blowers were started, and the pressure was raised, the high pressure came back on the flap-valve, and closed it. Of course, the high pressure flowed past the flap-valve to the district; and directly the compressors were stopped, and the pressure became reduced to the low pressure, the low pressure on the holders blew the flap open, and closed it from the district. This was an entirely different system from that used at Dunfermline by Mr. Waddell, inasmuch as Mr. Waddell employed continuous high pressure. At Lochgelly, he distributed gas at a pressure of about 2 lbs. per square inch. There was no trouble whatever with the blowers. They had had something like eighteen months' experience with the high-pressure plant; and since they started the blowers, the consumption in the district supplied had increased by fully 150 per cent., while unaccounted-for gas had not increased, though this might have been expected. They, however, conducted very systematic searches for leakage, and could afford, of course, to scoff at the old bogey of increased leakage from increased pressure. The amount of gas delivered during the last eighteen months was fully 9 million cubic feet; and the cost of compression was 0·68d. per 1000 cubic feet. The maintenance of the blowers and plant cost only about 0·15d. per 1000 feet; and the attendance on the apparatus had practically cost them nothing. From the time they started the blowers till they stopped them, they never required to go near them. The figures he had given were for the benefit of the meeting, and for the sake of comparison. They had never regretted putting down the high-pressure plant. It was a necessity when they considered it at the beginning. They were always extending the system, and would continue to do so, he believed, as circumstances required.

Mr. J. W. Napier (Alloa) thought the author was to be congratulated upon having conceived a design of apparatus whereby absolute, direct, and sensitive control was obtained of the conditions of pressure from the works to the consumer, in an area situated miles away from the manufacturing station. In his (Mr. Napier's) opinion, the return pipe was absolutely essential, and more particularly so when the demand for gas in a populous area was large, and when, on account of various circumstances, the demand might be required suddenly. The return-pipe was essential, on the same lines as in electricity departments, where a return-wire was laid in conduits along with electric cables, for the purpose of informing the attendant at the station what the demand was in the town. He merely mentioned this to show that electricity supply was, so far as that feature was concerned, worked precisely the same as the method adopted by Mr. Waddell. The valve, which he understood was the subject of a patent, appeared to be a success, and he understood had been, to various manufacturers, a much felt want. At Alloa, he had occasion to consider the question of a high-pressure supply to an outlying district, the pipe to which was laid about thirty years ago. Owing to the comparatively small consumption in the area, it was not considered practicable to lay a new pipe. He mentioned the circumstance, as it might be of advantage to others to know what could be done in such a case. He simply connected a small rotary compressor, driven by a 2 H.P. electric motor, to one of the street mains. In this respect, his arrangement differed from Mr. Waddell's, in so far as it drew the gas from one of the street-mains, thereby saving the expense of taking a special pipe from the gas-works. The cost of running the compressor was exceedingly small—only about 0·75d. per hour. The compressor was put to work during the lighting hours; the main-pipe being sufficiently large to meet requirements at other times.

Mr. C. W. Kraushaar (representative of the Bryan Donkin Company, of Manchester) said he had seen the plant working at Dunfermline, and had had it under very stringent tests. It appeared to meet all the requirements, as desired; and, as the manufacturers, of course, they were pleased to find that it had turned out so satisfactory. The special valve he had had under many tests; and he could speak to its working admirably. He could testify to this more particularly as it was not of his firm's manufacture.

Mr. W. B. M'Lusky (Perth) thought that Mr. Vass put the matter clearly when he indicated the case of a gas-engine starting and giving rise to a sudden demand in a remote district, because, however sensitive their station-governors might be, it was not to be expected that a station-governor, on a 15-inch main, would respond to a sudden demand. If he might cite another case, it was that which Mr. Napier had met in Alloa, where he distributed from a fairly large main, and carried the gas to a comparatively remote part of the district. His own experience had been different from either of these cases. They supplied the village of Bridge of Earn, about 4 miles from Perth, with gas at a moderately high pressure—starting with 12 inches. The plant had worked about eleven months. They used a Sturtevant blower. His object in deciding upon this was that it had advantages for his purpose over any of the systems which had been put before them that day. He had to meet variations in pressure of from ½ to 2 inches; but these variations did not disturb the action of the plant. A Peebles governor acted as a perfect governor, as it would act, in ordinary circumstances, on a consumer's meter. The only cost they had found computable was that of lubrication; and this, of course, had to be carefully attended to. Otherwise, in regard to attendance, the cost was infinitesimal.

Mr. Waddell, in reply, said Mr. Vass mentioned the matter of putting in an iron pipe, instead of a lead one, as he ultimately had to do. He was hardly inclined to say the last word on this subject. He thought it was better for everyone to consider for himself. He had told them of the difficulty he had had with block tin. He hoped it was quite understood that, in drawing in a pipe, it generally stretched; and in the case of the block-tin pipe, when it had stretched, a number of small holes were found. He had been told that block tin would be the best material to use; but he found it otherwise. With regard to what Mr. Keillor had said, he really could not put a figure upon the cost of working. The plant gave them no trouble. The engine ran so slowly that it would go long enough without any oil; and, apart from this, it required no attention, either morning or night. It was one of the economies of the system that, instead of having a pressure of 16 inches at the outlet, and perhaps 60 inches at the other end, while there was a small consumption on, and, again, having 60 inches at the outlet when, at night, they would have very much less at the other end—which looked to him to be waste—they had a more uniform pressure throughout. His idea was to get over this waste, and to give only the amount of pressure required at the other end, without any waste, so far as he could manage. This was what he had done. He was not aware that, if they left it alone for two days on end, there would be a bit of harm. The apparatus worked without any attention. Mr. Keillor mentioned the valve. The point about the valve was that it lay down unless the engine were working; and when it had to be raised, it was the compressor which raised it. It was the pressure which kept it up. It therefore did not cost anything to hold it up. When the compressor was stopped, it had its own weight to close it. He was almost compelled to do something in this respect, because, while their large holder had a pressure of 6 inches, the other holder had only about 4 inches; and considering that the district to be supplied was below them, he would have had nothing to work with at the other end. But the valve operated satisfactorily. He considered a safety bye-pass valve; but the difficulty in connection with it was that, when working with considerable pressure, the pressure would displace

the seal. This valve took away no pressure at all. Mr. Napier, as well as Mr. M'Lusky, had introduced high pressure, of a form to suit his own circumstances. He did not claim that his system was the thing to cure all evils. It was for each to think out matters for himself; but it had to be pointed out that, under both their systems, they only provided for a partial high pressure supply. In his case, he required a very low high pressure; but he was obliged to have the engine working through the whole 24 hours of the day. There was all the more reason why it should not be required to work against 60 inches pressure, when it was only necessary, for the purposes of supply, to have it working with 8 inches. Whenever it came about that a large supply was wanted, the apparatus naturally started itself. He had no doubt the partial stoppage they had was due to naphthalene. They noticed it about 8 o'clock at night, when the engine was required to work against 24 inches of pressure. He sent round to see what the drips were like. It was found that there was no water whatever in them; and then, in the morning, they saw that the pressure had come down to 8 inches. As long as the engine had power enough, and steam given to it, it went on supplying the pressure which they wished it to give.

A high-pressure pumping-station on Delaware Avenue, Philadelphia, described in "Engineering Record" some time ago, has proved so successful that it will be practically duplicated at Seventh and Lehigh Avenues, in the city's mill district. It will contain ten 300 H.P. Westinghouse vertical single-acting gas-engines direct connected to Deane triplex pumps and a 140 H.P. unit for auxiliary purposes. Fuel gas will be drawn from the street mains, and two large holders in different parts of the city will furnish the supply. Experience with the present plant indicates that any unit can be made ready to pump against 300 lbs. pressure in 45 to 60 seconds from the time the signal is received; and the whole station can be put in operation in from seven to ten minutes.

Presentation to a Cardiff Gas-Works Official.—Mr. Thomas Foster, who has been in charge of the Bute Terrace works of the Cardiff Gas Company for a period of nearly thirty years, was a fortnight ago made the recipient of valuable tokens of good-will and friendship from the officials, staff, and employees of the Company on his retirement. The presentation, which took the form of a gold watch, a beautifully illuminated autograph album, and a fountain pen, was made on behalf of the subscribers by Mr. George Clarry, the General Manager, who testified to the faithful services rendered by Mr. Foster during his long connection with the Company, and to the good feeling and loyalty which have always been a marked feature of his supervision. Mr. Foster feelingly acknowledged the gifts. A silver-mounted umbrella was also presented to Mrs. Foster.

The Calorific Power Test for Coal Gas.—In the course of an article by Professor Frank Clowes, D.Sc., F.I.C., the Chemist and Chief Gas Examiner of the London County Council, in the Engineering Supplement to "The Times" last Wednesday, he made the following remarks: "A clause has been recently inserted in a London Gas Bill which renders obligatory the maintenance of a reasonable standard of heating power in the gas supplied by the largest Metropolitan Gas Company—a Company which is responsible for making and distributing more than half of the whole amount of illuminating gas used in the County of London. This marks an advance in gas legislation, since, although special gas supplied for power purposes had already necessarily been of standard heating power, no company distributing ordinary coal gas at all comparable in importance with this greatest Metropolitan Company has hitherto adopted a calorific standard. . . . It is generally felt by those concerned with the gas supply to towns that the introduction of the calorific test marks an era, and that the example which has just been set by the largest Gas Company will be followed, as opportunity arises, by gas authorities generally. The consumer of gas will then pay for his gas as a heat generator; its value being mainly fixed for him by the calorific test."

Specification for Standard Cast-Iron Pipes.—The Engineering Standards Committee have just issued the British standard specification for cast-iron pipes for hydraulic power. The Committee engaged in drafting the specification met for the first time in June, 1904, and information as to current practice was sought from the principal users and manufacturers of hydraulic pipes, resulting in a mass of valuable information being placed at the disposal of the Committee. It was found that cast-iron pipes for hydraulic power as generally used fell naturally into two divisions, the greater number being for pressures from 700 lbs. to 900 lbs. per square inch; while in recent years much higher pressures, from 900 lbs. to 1200 lbs. per square inch, have been extensively used. Two standard series have, therefore, been drawn up to suit these respective ranges of pressure. The Committee regard 900 lbs. per square inch as the maximum permissible pressure for Class A, and recommend that Class B should be used when a working pressure of 900 lbs. per square inch and upwards is the normal working pressure. As regards the leading dimensions, the Committee have endeavoured, as far as possible, to fall in with the general practice in existing work as indicated by the replies received. In nearly every case it has been practicable to adopt dimensions which will allow pipes made to the standard specification to be connected to existing pipes without alteration.

ANALYSIS OF GASEOUS MIXTURES.

In the "Chemiker Zeitung" for the 3rd inst., Herr G. von Knorre deals with the estimation of hydrogen, methane, and nitrogen in gaseous mixtures. In an abstract translation of the communication in the "Chemical Trade Journal," it is pointed out that, where the more usual methods are followed, the nitrogen value has to bear the sum of all the errors; and hydrogen and methane are not determined with as much accuracy as could be wished by any of the methods which involve the explosion of a portion of the gas residue with air or oxygen. Fractional combustion with heated copper oxide, as suggested by Jaeger, enables the whole of the gas residue to be used in the experiment; but there are two drawbacks to the method as originally described. In the first place, a correction has to be applied for the oxygen of the air in the copper oxide tube at the beginning of the experiment; and, secondly, and of more importance, the Jena glass tube containing the copper oxide is liable to become distorted and change in volume. Herr von Knorre finds these difficulties can be wholly overcome by constructing the copper oxide tube of quartz glass, and filling it with nitrogen. The method is as follows: The carbon dioxide, heavy hydrocarbons, oxygen, and carbon monoxide are estimated in the usual manner by absorption. The residue is then passed slowly backwards and forwards two or three times from the burette or nitrometer into the potash pipette through the copper oxide tube, which is so arranged as to connect the burette to the potash pipette. The copper oxide is maintained at a temperature of 230° to 250° C., by which means the whole of the hydrogen but none of the methane is oxidized. After cooling, the reduction of volume is noted, and is the measure of the hydrogen. The heating and passage of the gas backwards and forwards is next repeated; but this time a bright red heat must be employed. The reduction in volume is the measure of the methane. The method not only does away with the necessity for batteries, coils, mercury, and palladianized asbestos, but provides a simple means of directly estimating the nitrogen. The gas is simply passed to and fro over the strongly ignited copper oxide, and the residual nitrogen is measured. Methane, too, can be quickly estimated, if the heavy hydrocarbons be absorbed by fuming sulphuric acid, and the other combustibles, save methane, burned at 250° C., at which temperature the heavy hydrocarbons are not oxidized by copper oxide.

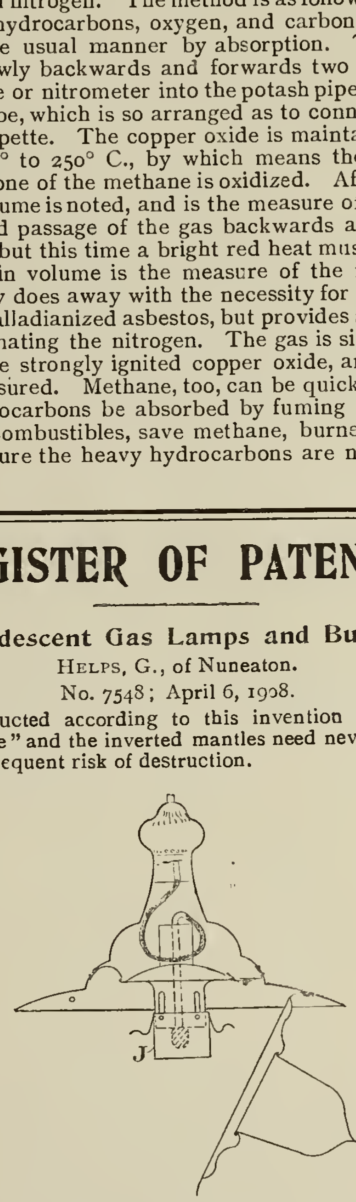
REGISTER OF PATENTS.

Incandescent Gas Lamps and Burners.

Helps, G., of Nuneaton.

No. 7548; April 6, 1908.

Lamps constructed according to this invention have "all parts readily accessible" and the inverted mantles need never be exposed to winds, with consequent risk of destruction.



Helps's Incandescent Burner Lamp.

The chimney or casing which surrounds and supports the burner is hinged to the outer casing of the lamp and carries a sleeve J adapted to be lowered for the protection of the mantle. The sleeve is provided with arms or projections which normally rest upon the door; and the burner is attached to the gas supply by a flexible tube or a swivel joint or the like, as described in patent No. 13,648 of 1907. In place of supporting the sleeve on the door, and allowing it to fall automatically on lowering the door, it may be normally a fixture upon the casing, but capable of being released by hand after the removal of the door.

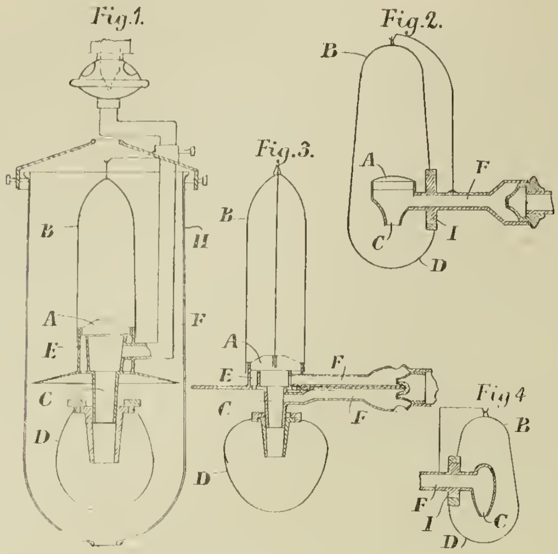
"Twin" Incandescent Gas-Lamps.

Eddrup, E. C. P., of Kensington, W., Boughton, H. F., of Birmingham, and Everson, W. H., of Willesden, N.W.

No. 13,754; June 29, 1908.

This invention has for its object to so arrange incandescent burners and mantles that a large portion of the amount of heat wasted in the ordinary arrangement is utilized "in creating more light, and consequently the consumption of gas is economized."

Fig. 1 shows one form of combined burners, mantles, and globe.



"Twin" Incandescent Gas-Burners.

Fig. 2 shows the burners and mantles where the inverted and vertical mantles are made in one or combined. Fig. 3 is a modification whereby the gas and air mixture supply to the combined inverted and vertical burners is separated. Fig. 4 shows the combined vertical and inverted mantles with an inverted form of burner only.

In figs. 1 and 3, a vertical burner A and mantle B are arranged immediately over an inverted burner C and mantle D, "in such a manner that any heat which has not been absorbed by the inverted mantle, and so transformed into light, passes up through the part E of the combined burners and is collected and absorbed by the vertical mantle B, and so utilized, and the consumption of gas thereby economized." The burners (with fittings and globes required for the two forms of lights) may be combined in one device as shown at fig. 1, where H represents two globes made in one—the lower part surrounding the inverted mantle and the upper part the vertical mantle. In order to better conduct the waste heat from the inverted to the vertical mantle, a transparent shield or baffle is used.

In fig. 1, the mixer F supplies the gas and air to the combined burners A and C, placed in juxtaposition; but in fig. 3, two mixers F are employed in juxtaposition—one for the vertical and one for the inverted burner.

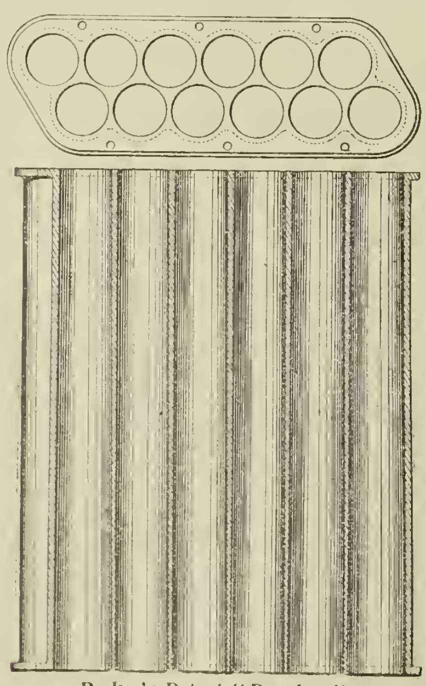
In fig. 2, the vertical and inverted mantles are made in one, and the combined burners are arranged at the end of the mixer F with a suitable fitting I, whereby the mantles are steadied. In fig. 4, an inverted burner only is used, and the vertical and inverted mantles are combined, so that part of the heat arising from the latter, or from the combustion of gases issuing from the inverted burner, will be absorbed by the vertical mantle—that is to say, "the heat which is not absorbed by the mantle D will become absorbed by the mantle B, and so be turned into light and not wasted as hitherto."

Retorts for the Destructive Distillation of Coal or Other Carbonaceous Substance—"Coalite Process."

PARKER, T., of Wednesfield.

No. 14,169; July 3, 1908.

This invention has for its object "to provide retorts of simple construction in which the charging of the substance to be destructively



Parker's Retort "Bunches."

distilled may be readily effected, and from which the residue may be expeditiously discharged."

Fig. 1 is a plan of a "bunch" or battery of retorts, and fig. 2 is a sectional elevation.

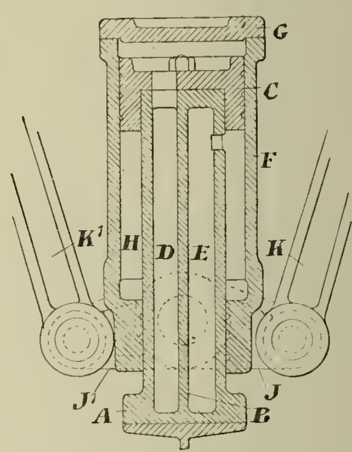
The series of tubes shown (of small diameter) are cast integrally together with their upper and lower extremities in one, with common top and bottom flanges or fittings—thus forming integral bunches or batteries of tubes. These respective batteries are mounted in the manner described in patent No. 4266 of 1908—that is to say, upon the upper flange is provided a hood common to all the tubes or retorts of each separate bunch or battery, forming an upper chamber above the tubes, from which the gases and vapours produced in the destructive distillation may issue through an ascension or discharge pipe communicating with the side of the hood—the hood being provided with a hinged cover-plate, which, when the tubes are to be charged, is removed to permit of the funnel of the charging hopper passing into the mouth of the hood and to allow ground coal or other carbonaceous substance to fall into the respective tubes. The lower mouths of the tubes of each battery or bunch are closed by a common cover-plate hinged so that it may be removed to fall away from the lower mouths of the tubes to permit of the charge falling out. Each bunch or battery of tubes is connected by its own pipe to the hydraulic main.

Closing the Doors of Retort-Stills.

PARKER, T., of Wednesfield.

No. 14,170; July 3, 1908.

This invention is more especially designed "for the purpose of opening and closing the cover-plates or doors of retort-stills used in the destructive distillation of coal, and for the purpose of effecting the closure with certainty and precision and for ensuring a gas-tight joint."



Parker's Retort-Still Lid-Closers.

The hollow standard A is provided centrally with a longitudinal partition B, forming two inlets for water or other liquid under pressure; and upon the top of this standard is mounted a piston C, and communication from above the top of the piston is made with one of the compartments D of the standard A and through the side of the standard from beneath the piston with the other compartment E. Upon the standard and the piston E is mounted a movable cylinder F, the lower extremity of which is suitably packed to ensure a good hydraulic joint; while, similarly, the piston C is packed for the same purpose, and the cylinder is provided with a cover-plate G.

On the admission of water under pressure to one compartment D in the standard, it will pass upwards above the piston C and lift the cylinder F; while, similarly, when water under pressure is led into the other compartment E, it causes the fall of the cylinder.

The hydraulic device for operating a set of closing cover-plates or doors is disposed intermediate of the doors or cover-plates to be operated by a lever H pivoted centrally at the lower extremity of the cylinder F and, at the extremity of one arm J, pivotally connected by a link K to one cover; while the other, J^1, is pivotally connected by a link K^1 to another, in such a manner that on the cylinder being raised the set of covers are closed, while when the cylinder falls they are opened.

Manufacturing Producer or Water Gas.

PETTIBONE, H., of New Rochelle, U.S.A.

No. 19,363; Sept. 15, 1908.

This producer-gas, or mixed producer-gas and water-gas, plant refers particularly to that type in which connected pairs of generators or producers are employed from which the gas is drawn off by jets of compressed gas which operate as an exhauster, and in which the sensible heat of the gas is utilized as well as the latent heat of combustion in a metallurgical furnace.

The patentee provides for drawing off a portion of the gas, scrubbing and cleaning it, operating therewith a gas-engine, and thereby operating a compressor to compress part of the cleaned gas for use in the jet-exhausters, which serve to draw hot gas from the generators and deliver it to furnaces. He also provides for reversing the action of either one of the jet-exhausters on a pair of connected generators or producers, producing a reverse current through one of the bodies of incandescent fuel, thereby causing pressure in one of the producers and vacuum or partial vacuum in the other one, and at the same time cleaning the fire of dust and ashes.

By the use of the devices and the apparatus described at great length (by the aid of a series of diagrams), he is able to "reduce the cost of a fuel-gas and power plant of a given capacity," as he dispenses with positive rotary exhausters, steam-engines therefor, boilers, and connections, &c., and "yet preserves the efficiency of the plant."

Intermittently Illuminated Gas-Signs.

ULLRICH, R., of Berlin.

No. 15,630; July 23, 1908.

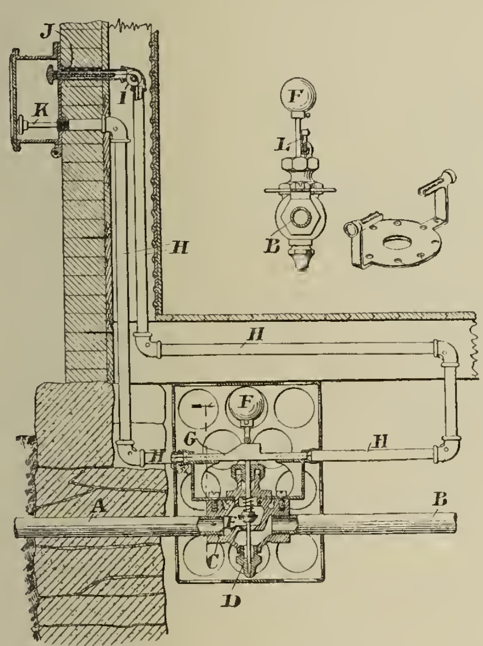
The patentee points out that appliances for the kindling and extinction of gas-flames are known in which a float or membrane connected with a cut-off member, owing to the alteration of the gas pressure, is given a movement which opens or closes the cut-off member. Or the periodical supply of gas to the burners is regulated by means of a bell, which, owing to the arrangement of valves, automatically becomes alternately filled with, and emptied of, gas, whereby the actuation of the valves is produced by the bell by the intermediary of a trip lever. Yet another known arrangement is the automatic displacement of the gas supply-valve by means of two bellows, which are alternately filled with gas and emptied. The present invention provides apparatus for producing an intermittent light for advertising signs, giving signals, and so forth, in which the member serving for the periodical cutting-off of the current of gas supplied at a constant or fluctuating pressure is worked by a body operated by the gas pressure itself, whereby the duration of the separate periods is not dependent upon the quantity of gas passing through the apparatus in a unit of time.

Gas-Controlling Apparatus.

SIEBEN, H., of Kansas City, U.S.A.

No. 20,049; Sept. 23, 1908. Date claimed under International Convention, Jan. 24, 1908.

This apparatus is designed for use in connection with buildings, to permit the gas supply to be cut off manually in the event of fire or automatically if it is subject to a predetermined heat.



Sieben's Gas-Controlling Apparatus.

The illustration shows a sectional view of part of a building and part of the gas-controlling apparatus, with a part section and a detail perspective view of a bracket later on referred to.

A is the gas-pipe leading from the main to a valve casing; the house pipe B leading from the casing into the building. The valve has a perforated diaphragm C between pipes, and below the perforation of the diaphragm is equipped with a removable cup D, having its chamber reduced to provide a guide passage for the stem of a valve E. The stem is fitted with a spring bearing at its lower end upon the valve, and at its upper end against a cap closing an opening in the valve casing above the diaphragm, and forming, in conjunction with the cap nut, a guide and stuffing box for the valve stem. The spring thus tends to seat the valve and cut off the supply of gas from pipe A to pipe B; and to co-operate with the spring in closing the valve, the stem may also be provided with a weight F.

To normally hold the valve unseated, a roller is secured by a fusible substance to the valve stem; the roller resting upon the cam trackway of a reciprocatory bar G. The guides of the bar terminate in circular heads to receive the ends of a pair of similar conduits, preferably consisting of tubes H coupled together by elbows and leading to any point desired. The couplings in their inner sides are slotted as at I, in order to permit guide-rollers to be fitted within them; the parts being so proportioned that cords (hereafter referred to) cannot be disengaged from the rollers. As shown, the ends of the conduits opposite to the coupling heads of the guide-bracket extend through the wall of the building contiguous to which the valve is arranged and into which the supply pipe A extends.

One end of a cord or cable is preferably secured in the tube J, and the corresponding end of another cord is secured to a tube K, which tubes project into a glass face box, and are equipped with handles. The cords thus never become exposed in the box when the handles are pulled forward, and consequently cannot sag from the front end of the conduits and interfere with the free operation of the slide bar G. When the slide bar is in the position shown, the lower handle is drawn forward and the upper handle is in contact with the contiguous end of its respective conduit. Should the building take fire and "gain considerable headway before it was discovered," and the heat rise to a predetermined degree, the connection between the valve stem carrying the weight F and the angle bracket L would fuse, and, as a result, the valve E would automatically close and cut off the supply of gas to the building. Should the house occupant discover the fire before the heat was sufficient to fuse the connection mentioned, he could pull forward the top handle, and so slide the bar G to the right and permit the valve to close. To reset the valve in the event that the bracket L remained fastened to the valve stem, the lower handle would be drawn forward—reversing the operation of the bar G, and causing the cam to engage the roller and force it, and hence the valve E, upward to their original positions.

Prepayment Gas-Meters with Differential Wheel Gear.

KETTERER, F., of Furtwangen, Germany.

No. 22,088; Oct. 19, 1908.

This invention relates to the type of prepayment gas-meters wherein, by means of differential gear, the movement of the cam which actuates the gas-valve is derived from the turns, or the initial turn, of a coin receiver in the one direction (for opening the valve) and reversed by a rotation of the counting spindle acting in the other direction, so as to tend to close the valve—the spindle also actuating the indicator of the consumption of gas. Consequently, several successive prepayments, each effected by one rotation of the spindle, are rendered possible without a further operation of the meter being dependent on the previous closure of the valve.

The operating mechanism is chiefly characterized by the peculiar arrangement of a two-wheel differential gear, the parts of which simply consist of an internally toothed pericyclic wheel and an externally toothed epicyclic wheel, which intermesh with each other in the same plane. This dispenses with the employment of spheroidal screws and other like means coacting with the differential gear as in known prepayment meters.

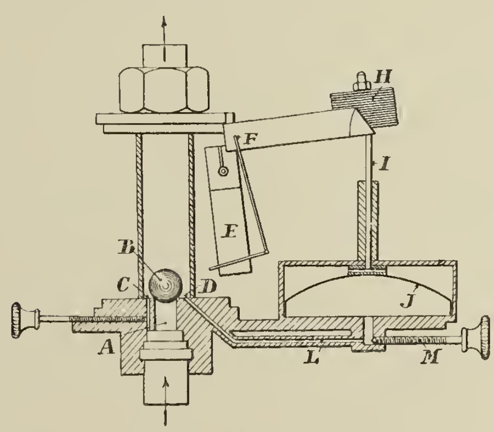
The patentee's claim is for a prepayment meter comprising a coin receiver adapted to be rotated by hand after the insertion of a coin and transmitting its rotation to a valve-controlling disc through the medium of differential gear actuated, on the other hand, by the reverse tendency of the counting mechanism. The differential gear consists of a pair of spur-wheels intermeshing internally in the same plane, one of which is guided on an eccentric crank pin during the rotation of the coin-receiver, and has outer teeth engaging with the other internally toothed gear wheel, which latter is journalled centrally to the axis of the coin receiver, and is driven by the counting mechanism—thus causing the first-mentioned differential wheel to advance in a differential ratio and to operate the valve-controlling disc accordingly.

Intermittent Gas Lighting Burner.

SOCIÉTÉ CLERC-BIDAULT ET CIE., of Paris.

No. 4895; Feb. 27, 1909. Date claimed under International Convention, Sept. 19, 1908.

This apparatus for intermittent automatic illumination by means of gas-burners consists (as shown) of a movable obturating member—a sphere of magnetic metal—arranged inside the gas-conduit and subjected to the attraction of a magnet hinged outside the conduit and connected to a diaphragm forming a wall of a gas-chamber in communication with the part of the conduit comprised between the obturator and the utilization devices, with the object of opening and closing the conduit intermittently.



Intermittent Gas-Flash Lighter.

The apparatus operates as follows: The membrane J being deflated, the rod I will be depressed; and under the influence of the weights H, the magnet E will have rocked around the hinge F and will contact with the wall of the cylindrical chamber. The steel ball B is thus attracted towards the magnet, and adheres to the inner wall of the chamber, but will not block the orifices C and D. The orifice A being uncovered, gas will enter the cylindrical chamber freely, and thus reach the burners, which will be fully kindled. At the same time, however, a certain quantity of gas will pass through the orifice D and the passage L beneath the membrane, and inflate it. The rod I will then rise, and the magnet will rock around the hinge F and assume the position shown. Its action will no longer be exerted upon the ball, which will again fall into its normal position and prevent gas passing to the burners. As the pressure diminishes in the cylindrical chamber, the membrane will empty, and the gas contained in it will flow towards the burners and help to maintain them kindled as pilot lights. This collapse of the membrane is assisted by the pressure exerted upon its upper face by the weights.

When all the gas contained in the membrane has flowed towards the burners, the magnet again contacts with the cylindrical chamber, and the ball will be attracted from its seat. The previous operation will

then be repeated, and the periodical kindling and extinction of the burners will take place automatically and uniformly.

By means of a pin valve M, it is possible to regulate the duration of the kindled and extinguished phases at will by obturating the orifice for admitting gas beneath the membrane and discharging it therefrom to a greater or less extent.

The variations of pressure in the town supply mains will not exert any prejudicial effect upon the operation of the apparatus. The sole effect will be to produce the variation in the duration of the kindled phase within small limits, seeing that the weight H may be selected to permit the membrane ascending with the smallest possible pressure.

Attaching Incandescent Mantles to Mantle-Rings.

SKRIWAN, E., of Vienna.

No. 6963; March 23, 1909. Date claimed under International Convention, March 28, 1908.

This process for enabling the attachment of incandescent mantles to mantle-rings to be effected more rapidly and simply, and at the same time much more exactly, consists in that, by means of a mandrel, the mantle to be attached is shaped in and over a hollow body; the edge of the mantle overhanging the latter being fixed by needles. A string or cord passed through the edge of the mantle is then laid round the needle ends, and tightened; and the overhanging edge of the mantle is folded over the loop of the cord or string inwards, and after the mantle-ring is placed into the opening of the mantle the needles are put out of action and the loop tied.

APPLICATIONS FOR LETTERS PATENT.

16,716.—ASHFORD, A. G., and WILLIAMS, A. J., "Gas-engine." July 17.

16,746.—RHODES, J., JONES, W., and GARNETT, W., "Gas-burners." July 19.

16,766.—DODD, F. W., "Gas-engines." July 19.

16,768.—JOHNSON, G. E., "Gas-fittings." July 19.

16,778.—HÖFFLER, K., "Opening and closing apparatus for gas-pipes." July 19.

16,858.—LIDDLE, J., "Safety gas-cock." A communication from the Hasty Manufacturing Company. July 20.

16,871.—MAY, T., "Gas-purifiers." July 20.

16,890.—HAMMER, M., "Portable geyser." July 20.

16,897.—CRICK, E. H., "Regulators for gases." July 20.

16,925.—GIBBONS, W. P., and MASTERS, J. R., "Vertical retorts." July 20.

16,932.—SÄMANN, L., "Gas-regulator." July 20.

16,952.—ANDERSON, D., "Controlling devices for lighting systems." July 20.

16,966.—EGERTON, H. W., "Air-gas generator." July 21.

16,998.—BLOCK LIGHT COMPANY and WEBBER, J., "Incandescent burners." July 21.

17,011.—JOHNSON, W. C., "Improvements in means for producing a light." July 21.

17,074.—LYMN, A. H., "Production of gas and ammonia from peat and like fuels." July 22.

17,082.—HUNT, W., "Exhauster or compressor for gases." July 22.

17,112.—GIBBONS, W. P., and MASTERS, J. R., "Vertical retorts." July 22.

17,158.—LYNES, W., "Gas-fittings." July 23.

17,165.—SMITH, H. P., "Pipe-joints." July 23.

17,194.—WOLF, O., BAMBURY, N. F., and BERNARDY, E., "Incandescent gas-lamps." July 23.

17,195.—WOLF, O., BAMBURY, N. F., and BERNARDY, E., "Supplying gas for illuminating and like purposes." July 23.

17,209.—LEAVER, E. T., "Solidifying tar." July 23.

17,219.—TULLY, C. B., "Incandescent gas-lamps." July 23.

17,227.—SCHMID, C., "Fittings for gas and other pipes." July 24.

RESTORATION OF PATENT.

Notice is given that an order was made on July 22, restoring the patent granted to JAMES MALLOL for "Improvements in incandescent gas-burners," No. 19,776 of 1900, dated Nov. 3, 1900.

Brighouse Gas Undertaking.—At the meeting of the Brighouse Town Council last Wednesday, the Chairman of the Gas Committee (Alderman Healey) made a statement with regard to the gas-works which have recently come under the management of Mr. Harold Davies. In the course of his remarks, he said the Committee had accepted tenders for the coal required during the coming year; and he was glad to be in a position to inform the Council that they had been able to contract for 12,000 tons at prices which averaged about 1s. 0½d. per ton less than was paid last year. Unfortunately, their old contracts had still a few months to run; so that the Corporation would not receive the benefit of the new and reduced prices until about half of the present financial year had passed.

Death from Gas Poisoning.—At the Liverpool City Coroner's Court a few days ago, Mr. T. E. Sampson held an inquiry concerning the death of Thomas Sansbury, aged 70, a master mariner of Douglas, Isle of Man. Deceased took apartments at a temperance hotel in Liverpool, and at night was shown to his room. He had been drinking, but was not drunk. Next morning an assistant at the hotel detected a smell of gas. She found the deceased's door closed, and locked on the inside. After knocking several times, calling to him and getting no answer, she had the door forced open. On entering the room, she found it full of gas, and heard the gas escaping; the tap being turned on to its full extent. The deceased was lying on his back dead. A medical man was summoned, and he said life had been extinct for about six hours. There was only one window in the room, which was small, and it was fastened; while the fireplace was practically hermetically sealed. Evidence was given that some of the brackets and taps about the house were defective; and the Coroner called attention to this. The medical evidence was to the effect that the man died from gas poisoning; and the Jury returned a verdict accordingly.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Livesey Memorial Fund.

SIR,—I received a letter this morning from the Secretary to the County Borough of Smethwick, calling my attention to the omission of the amount of ten guineas contributed to the above fund by the Smethwick Corporation.

I find the omission occurred owing to an oversight here, and should be much obliged if you would state in your next issue that the list of subscriptions from Corporations (p. 257) should have included £10 10s. from the Smethwick Corporation Gas Committee.

W. T. DUNN.

39, *Victoria Street, S.W., July* 29, 1909.

The German Experiments with "Flicker" Photometers.

SIR,—I observe in a short account of "Photometric Testing at the Reichsanstalt in 1908," on p. 258 of your issue of July 27, the outline of some experiments made with "Flicker" photometers.

It is stated firstly that the "Flicker" photometer in testing lights of different colours presents no advanage over the ordinary methods of comparison by balance or contrast photometers, and secondly that the "Flicker" photometer is not independent of the colour sense.

Now, Sir, with respect to the first point, it must be within the recollection of everyone connected by practice with photometry that, until Mr. Simmance and I produced the "Flicker" photometer head, there was never any certainty with respect to values of lights the colour of which is different to standards of light. The instrument was speedily adopted on all sides, and is in continued and increasing use; so much so that I think I am justified in saying that it is the standard method for these purposes. Not one, but several firms in Germany approached us for permission to make it; but for commercial reasons (not dissociated with the independence which Protection gives to German manufacturers), no business arrangement was entered into by us. Accordingly, the German makers fell back upon the old text-books, and produced Rood and Whitman arrangements under different names, while several "patents" have been applied for by makers. At the time the "Flicker" head was produced by us, no such device was in existence; and it was Dr. Bunte himself who was so struck with the advantage of it, that he introduced it in one form to the Zurich Congress, while Professor Vivian B. Lewes exhibited a modified form we constructed.

This brings me to the second point, which is that if (as I gather) the experiments now cited were made with the Whitman and Rood "photometers," I do not wonder that the learned experimentalists arrived at the conclusions they state. Mr. Simmance and I have continually hammered it into people that these arrangements are not photometers at all. They are examples of the "Flicker" phenomenon, but are not photometers; and experience and time show that it is almost impossible to make a practical and perfect "Flicker" photometer without following the rules laid down by us in our patent specification, to which rules the Rood and Whitman arrangements do not conform.

We have from time to time made and published experiments on the question of colour sense. We are absolutely certain of the soundness of our conclusions; and it is naturally open to anyone to experiment with the Simmance-Abady instrument and prove or disprove what we have stated.

I have no possible doubt either as to the soundness of the theoretical grounds upon which we base our contention, nor of the accuracy of the experiments that we and others have made in proof of it. I have time after time taken a colour-blind person to a photometer bench, and he has made independent readings of different coloured lights which have absolutely coincided with my own and other people's readings.

It should be clearly understood, with reference to the advantage of the "Flicker" head, that it is, of course, possible for an experienced and unbiassed photometrician to use a contrast head with differently coloured lights of low power; but as Professor Lewes, when claiming this power himself, cast doubt on the possibility of any of his audience (some 200 or 300 men, all with a good knowledge of photometry) performing the same feat, so do we claim that the use of the "Flicker" head is essential with high-power lights, and in all cases renders results certain, however inexperienced the observer.

JACQUES ABADY.

Westminster Palace Gardens, S.W., July 29, 1909.

"Electricity for Everybody."

SIR,—My attention has been called to the review in your issue of the 27th inst., upon my book bearing the above title; and I am sorry you should think it likely to have such a deleterious effect on the gas industry as to make it necessary for you to occupy no less than three columns of your valuable space in an attempt to discredit it. As, however, practically the whole of your criticisms apply to only 14 pages out of the 325 pages, I am encouraged to hope that you consider the remaining 311 pages are occupied with the "many useful features" that you refer to.

Coming to details, may I say that your comment on the system suggested for estimating consumption is "a fair sample of the looseness, the inaccuracy, the ignorance, or the wilful misrepresentation (I do not know which it is) that is found throughout?" I did not state that an 8-candle power lamp would consume so many units per annum, but that the "average" consumption of all the 8-candle power equivalent lamps in the building would be found to work out at something near the figures given (which are the result of actual experience). There are many lamps—in upstairs rooms and passages, cellars, lavatories, &c.—only occasionally used, consuming far less than the average, while other lamps use far more. Your method of argument would imply that because it is known that "The Times" has a circulation of so

many thousands, therefore the "JOURNAL OF GAS LIGHTING" and every other paper has the same.

As to the dirty ceilings and the "tortious" effects of burning gas (even with incandescent burners), I must leave the next housewife you meet to tell you; and from the same source you may learn that only a few incandescent burners are used in the average house, the remainder being the old flat-flame ones.

I will not express the opinion that your review is "guilty of fabrication and omission," but will venture to say that those who read in their proper context the extracts you give, will have a very different impression of their import.

In conclusion, I would emphasize the fact that the book is not a philippic against gas, which is only referred to in a few pages, but its object is rather to provide useful information about electricity for everybody in home, or shop, or factory. If my view of the future of electricity is too roseate, it is, at any rate, not discouraged by the statement on the same page of your "JOURNAL" that the electricity supply companies in the United States now number about three to every one of the gas companies.

I shall be obliged if you will publish this letter, in order that any wrong impression received by your readers may be removed.

R. BORLASE MATTHEWS.

Kingsway, W.C., July 29, 1909.

[Our correspondent is quite right. We could not afford more than three columns for the misstatements in his book in regard to gas, though there was a strong desire to write more. As to his reference to the electricity supply companies in the United States numbering about three to one of the gas companies, that is nothing novel. In London, the electricity undertakings number about ten to one gas undertaking. We refer readers to our criticism of Mr. Matthews' book last week for the answer to the remainder of his letter.—ED. J.G.L.]

Retort-House Work.—Light v. Heavy Charges.

SIR,—I have delayed referring to the letter of Mr. Charles Carpenter published in your issue of the 13th inst., in the hope that someone else might have been disposed to give his experience on the subject.

Mr. Carpenter's experience is on such an extensive scale that his views will be of immense interest to your readers. His results are, of course, unquestionable, though it is gratifying to find that until recently he held the opinion that light charges and rapid changes were the correct thing for gas-making purposes. That the results of my experiments were not in accordance with the more modern view, may possibly have been due to variations in the quality of the coal, temperature of carbonization, and other matters.

With reference to the excellent paper read by Mr. J. Ferguson Bell at the recent meeting of the Institution of Gas Engineers, I may say that my letter was not intended as a criticism. In my opinion, the paper was one of the most important and practical ever submitted to the members. The painstaking and careful work involved in obtaining and recording all the information must have been enormous.

My object was to elicit some further information on the subject of retort charges; and this has been accomplished through the courtesy of Mr. Carpenter, whose letter also furnishes a reply to that from Mr. J. G. Tooms, published in the same issue.

EDWARD A. HARMAN.

Huddersfield, July 23, 1909.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Heywood Corporation Bill.

Bill reported, preamble not proved: Glamorgan Water Board Bill.

Bills reported, with amendments: Gaslight and Coke Company Bill, Mountain Ash Urban District Council Bill, Northallerton Water Bill, Oldham Corporation Bill.

Bill read the third time and passed: Blackwood Gas Bill.

The Lord Chancellor informed the House on Thursday that the promoters of the Salford Corporation Bill did not intend to proceed further with it. An order was made accordingly.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill read a second time and committed: Gas and Water Orders Confirmation Bill [Lords].

Bill read the third time and passed: Heywood Corporation Bill.

The Risca Urban District Council Bill [Lords] has been referred to a Select Committee, consisting of Mr. Arthur Stanley (Chairman), Mr. G. D. Faber, Mr. G. H. Morgan, and Mr. G. Hardy; to meet on Friday.

Huddersfield and the Longwood Gas-Works.—At the monthly meeting of the Huddersfield County Borough Council, Mr. Cartwright referred to a minute to the effect that no further steps be taken in the matter of the purchase of the undertaking of the Longwood Gas Company. He asked what the nature of the negotiations were, and if any offer had been made by the Company or the Corporation. He would not press for anything to be divulged which ought not to be made public; but he thought that the ratepayers of Longwood had a right to know how the matter stood. Alderman Jessop said they had been making an effort to remove the injustice from which the Longwood gas consumers had been suffering, and had endeavoured to get gas for them at the same price as was paid in the borough. The resolution did not say that no further attempt would be made.

LEGAL INTELLIGENCE.

Water Rate for Unoccupied Premises.

At the Westminster County Court, last Thursday, the Metropolitan Water Board sued Mr. J. H. Montague, a surgical instrument maker, of New Bond Street, W., for £29 17s. 6d. for four quarters' water-rate. Mr. Desmond Collins, solicitor, who appeared for the Board, having formally proved the amount due, defendant said the original claim, made on a final notice, with a threat to cut the water off, in February, was for £37 7s.; but he refused to pay. Then, when a summons was issued, the amount was reduced, without a word of explanation, to £29 17s. 6d. He had paid into Court £28 7s. 9d., and contended that this was all he was liable for. Under the Board's Act of 1907, it was laid down that where no inhabited house duty was paid there must be a minimum rebate of 20 per cent. and a maximum rebate of 30 per cent. The premises in question were unoccupied for twelve months, and water was not used. At first 5 per cent. was allowed, and a threat made to cut off the water; but he defied the Board. Then they sued him, allowing 20 per cent. rebate; and he paid in an amount based on 30 per cent.—maintaining that it was the duty of the Board, in an exceptional case like this, to allow the maximum rebate. Mr. C. R. Cuff (Senior Registrar) said the Board had the right under their Act to decide what rebate they would allow. Defendant said it was most iniquitous. Mr. Cuff replied that he could not deal with this; and he ordered payment of the amount in a fortnight.

Charge for Water and Meters at Portishead.

The Magistrates at the Long Ashton Petty Sessions were recently engaged in hearing a case which came before them on a summons based on an information laid on behalf of the Portishead District Water Company for adjudication upon certain disagreements which had arisen between them and the Urban District Council as to the rates, quantities, terms, and conditions upon which water was to be supplied to them for the purposes mentioned in section 37 of the Water-Works Clauses Act, 1847—viz., for cleansing sewers, drains, &c., and for other public purposes. The questions submitted for the decision of the Bench were: (1) The charges to be made by the Company to the Council for meter-rent. (2) The rate per 1000 gallons to be paid by the Council to the Company for water supplied for the purposes mentioned in section 37 of the Act of 1847. (3) Whether the Company are entitled to charge the Council a quarterly minimum; if so, to fix the amount. The Bench decided that the Council should pay 3s. 6d. per quarter for a ½-inch meter on each of the Council's supplies; that the charge for water for public purposes might be at the rate of 1s. per 1000 gallons; and that the Company were not entitled to charge the Council a quarterly minimum amount in respect of water supplied for public purposes. It was further decided that the costs of the Court were to be paid by the Company and the Council in moities; otherwise the parties were to bear their own costs. Leave was given to appeal.

Laindon and District Gaslight, Water, and Coke Company, Limited.—On Thursday last, Mr. Justice Eve made an order, on behalf of a debenture-holder in this Company, appointing Mr. Barber, of Old Jewry, receiver and manager. Mr. MacSwinney, who appeared for the plaintiff, said the debenture issue amounted to £4770, and the principal money was now due. Counsel for the Company consented to the order, which gave the receiver liberty to act at once, but not as manager after Oct. 31, without leave of the Court.

Thefts from Prepayment Gas-Meters by a Boy.—A boy of 15, named John Delvard, was recently before the Bolton Magistrates charged with stealing money from prepayment gas-meters. The meters in six cottages in one street were found to have been broken open, and the money abstracted. Suspicion fell on Delvard, and when he was arrested at a local theatre his pockets were found to be full of coppers. On being charged, he pleaded guilty, and was sent to an industrial school for a period of three years; the father being ordered to contribute 1s. weekly towards his support.

Dispute as to the Registration of a Meter.—A discussion with respect to the working of gas-meters took place last Wednesday at the Isle of Wight County Court, where his Honour Judge Gye was asked by the Freshwater Gas Company to give judgment in an action brought by them for £2 6s. 3d. against a customer named Fleming, for gas supplied. The defendant alleged that the meter was wrong; but evidence was called as to the periodical readings of the meter. His Honour held that there were such discrepancies between the quantities of gas alleged to have been consumed and recorded, that he could not give judgment for the plaintiffs. Mr. Parker, on behalf of the Company, applied that a case might be stated for argument in a Superior Court; but this was refused, as there was no point of law involved.

Acetylene Explosion in a Mine.—Mr. Justice Walton delivered judgment in the King's Bench Division of the High Court of Justice last Thursday in the case of *Quinn v. Ullcoats Mining Company*, which was tried before him and a Jury at the recent Carlisle Assizes. The action was brought by Mrs. Agnes Quinn, on behalf of herself and her four children, to recover damages for the loss of her husband, who was killed by an explosion of acetylene gas at defendants' iron ore mine at Egremont, in December, 1907. There was a strike at the mine, which was closed down, and became flooded, with the result that an acetylene gas-generator was submerged. In the following April the water was pumped out and the mine reopened. Plaintiff's husband and three other men were instructed to clean the generator, and in doing so they used naked candles. The water in the tank of the generator had become saturated with the gas, and an explosion occurred by which the plaintiff's husband was killed. The Jury found that defendants were guilty of negligence in not seeing that safety lamps were provided, and assessed the damages at £530. His Lordship decided that the plaintiff was entitled to this amount; and he entered judgment accordingly, with costs.

MISCELLANEOUS NEWS.

THE SUCCESS OF CO-PARTNERSHIP.

South Metropolitan and South Suburban Companies' Schemes.

Once more, last Thursday, was the Crystal Palace the scene of one of those remarkable gatherings which have for some time been an annual feature in the life-history of co-partnership. That is to say, a number of the employees of the South Metropolitan and South Suburban Gas Companies, with their wives, were invited by the Directors to celebrate the continued successful operation of the scheme. Though the great pioneer in this momentous reform for the bettering of the condition of the gas-works employees—and others—has passed away, this pleasant yearly gathering which he originated is, we are glad to see, to continue, in accordance with what it is felt would have been his wish. Thursday's proceedings began with dinner in Lyons's Restaurant; and by a different arrangement of the tables it was on this occasion found possible to provide seating accommodation for some forty more people than in previous years. In all, between 450 and 460 sat down; and, as usual, a most enjoyable time was spent. After dinner, there followed speeches, to the point, and full of enthusiasm for the system which has been so great a success—full also of affectionate and grateful references to Sir George Livesey, whose loss his many friends will never cease to deplore. Mr. Charles Carpenter, the new Chairman of the South Metropolitan Company, presided; and he was supported by Mr. Charles Hunt, who is now at the head of the South Suburban Company, and numerous Directors of both undertakings, the principal officials of which were also present.

The Loyal Toast having been honoured, Mr. Carpenter remarked that it did not seem possible that a year had elapsed since their last Co-Partnership Dinner; and he did not think that any of those who were present twelve months ago could have imagined for a moment that the next dinner would be held without the presence of him who did so much to put co-partnership on a sound and an enduring basis. They could not do better, he thought, on the present occasion than show their respect for the great and good man to whom they all owed something, and many of them much, by drinking to his memory. He would ask them, therefore, to rise in their places, and silently drink to the memory of their true friend and great co-partner, Sir George Livesey. Everyone in the room immediately responded to the suggestion; and to those present the scene was a most impressive one.

On again rising, Mr. Carpenter remarked that there was one other toast upon the list—that of "Co-Partnership"—and he was going to call upon Mr. Hunt to propose it. Mr. Hunt had been introduced to them in the past on more than one occasion by Sir George Livesey; and he need now only remind them that Mr. Hunt had taken Sir George's place as Chairman of the South Suburban Gas Company. Those who knew him were aware how thoroughly his sympathies were in accord with the principles of co-partnership; and he was sure they could not have a better advocate than Mr. Hunt.

Thus called upon, Mr. Charles Hunt proposed "Success to Co-Partnership," and said it was now exactly seven years since Sir George Livesey honoured him by an invitation to join the Board of the South Suburban Company—then the Crystal Palace Gas Company. He had thus had an opportunity of observing the inner working of the co-partnership system; and having served this full term of apprenticeship, as it were, he was able to state that, though he had not found, nor had he expected to find, perfection, yet every year of added experience had strengthened his conviction that co-partnership was an ideal means of uniting the interests of Capital and Labour, and had increased his admiration for the prescience of him who was the founder of it. What did the employer gain in return for the bonus which was given over and above the current rate of wages? The answer was that he got loyal and willing, and in some cases devoted, service; and this was worth any system of profit-sharing. Now, what did the wage-earner obtain? Some ill-disposed people had said that co-partnership was a system of driving and sweating. He only wished that these persons could have been present to-day, to look about them at the happy faces surrounding the tables; for he was sure that they would then be dispossessed, once and for ever, of this idea. What did co-partnership really do for the wage-earner? For many of them, at least, it meant practical emancipation from a hand-to-mouth existence, and the prospect of enjoying at some future time what a famous countryman of their friend Mr. Ross had called "the glorious privilege of being independent." There were no doubt some who had at first looked somewhat askance at a system under which they were not permitted to finger more than one-half of the bonus allotted to them; but these had long ago fallen into line with the rest, and the figures showed, he was glad to say, that nearly, if not quite, all the bonus was now invested year by year. He was not, of course, able to do more than to refer to the figures relating to the South Suburban Company; but these showed that since the establishment of co-partnership in 1893 or 1894, no less a sum than upwards of £33,000 had been distributed up to the end of the last financial year. They also showed that the present investments in stock and on deposit amounted to upwards of £34,000. There were now 36 co-partners who held more than £100 of stock; while the average holding per co-partner was £50. Figures like these surely meant that many a home had been made brighter by the knowledge that something was being laid aside for a rainy day, or for the time when work had to cease. And could they wonder that Directors rejoiced, when they saw, year by year, these investments increasing, and when they were able to announce an increase in the rate of bonus? It did them all good occasionally to take stock of progress; and gatherings like the present afforded an excellent opportunity of doing so. Moreover, the social intercourse which they promoted, and to which the presence of ladies, whom they were very glad to see there, contributed so largely, was a realization of that good-fellowship which it was desirable should subsist among those who were pursuing the same aims and the same objects. He hoped at some future time it might be possible to enlarge this gathering so as to make it representative of all the companies in and around London who had adopted co-partnership. That would indeed be a notable gathering, because, as they were fully aware, co-partnership was now the rule among these Companies, instead of the exception. The South Metropolitan and South Suburban Companies stood, however, in a somewhat different position from the others, inasmuch as they were the only two who had put what Sir George Livesey termed the top-stone to the edifice of co-partnership—they were the only two Companies who had combined with the system of co-partnership that of employees' Directors. It was to be hoped that their example would in course of time be followed by others, because one of the principal objects of the employees' Director was to put the respective Boards in touch with all classes of the employees, so as to create between them mutual sympathy and confidence. He was glad to say that this object had been wholly attained by the excellent selections that had been made from time to time by the co-partners, and which formed the best possible security for the permanence of the system. He would like to say one word more. Among the many honourable traditions associated with Sir George Livesey's long and successful leadership was that of supplying gas cheap. They were anxious to maintain this tradition; but it was becoming increasingly difficult to reduce prices owing chiefly to a falling off in the increase of business. They were endeavouring to overcome this; and their friend Mr. Waller had suggested that every co-partner should become a co-operator to this end. The idea seemed to be an excellent one, because there could be very few, if any, co-partners who could not do something to extend the use of gas among their friends and neighbours. They had to remember that in this, as in all other matters of the kind, the interests of the Companies were those of the employees—both as shareholders and as co-partners—and that they were pledged to promote those interests. It was the "call of the blood," so to speak, to every true co-partner; and so long as this call was answered, so long would co-partnership flourish and their undertakings prosper.

The Deputy-Chairman of the South Metropolitan Company, Mr. J. Ewart, remarked that their thoughts naturally reverted that day to the great loss that the two Companies had sustained during the past year. Among all the Directors of the South Metropolitan Company, if any-one had been asked to select the one whose life promised to be the longest, he thought the choice would have fallen upon the Chairman, though he was, of course, at that time rather tired and worn, as he had been, as was his custom, getting through very arduous work in connection with the important positions to which he had been called, and which he had occupied so admirably. Shakspeare had said: "The evil that men do lives after them, the good is oft interred with their bones." There was doubtless a large amount of truth in this; but it certainly did not apply to Sir George Livesey. If they sought every-where, they would find no evil; while they had only to look round the tables at the contented, happy, and prosperous faces to see a part of the good that had lived after him. It was also satisfactory to know that their example was being followed in so many directions. Within the last year, a considerable number of undertakings, both large and small, had adopted co-partnership principles; and he was sure they would never live to regret it. A meeting took place the other day of one company who put a scheme into operation in the past year; and the report of the proceedings was certainly interesting. He referred to Messrs. Furness, Withy, and Co.—one of the first shipbuilding concerns to adopt the principle; and the meeting was the first held since its adoption. The Chairman, while regretting the smallness of the dividend, which was 5 per cent.—the South Metropolitan Company were satisfied at present with 5¼ per cent., so he did not know why there should have been this regret—said he considered their ability to pay a dividend at all was as good a proof of stability as could in reason be desired. He then went on to say that, in regard to the inauguration of the Company's co-partnership scheme, his simple aim had been to secure that all the enterprise and capital and labour brought together should be directed to one end—the highest possible productivity under fair conditions, free from the waste friction entailed, and by which all must suffer. These results, and more, had been achieved in the South Metropolitan Company by co-partnership, for by it they had all been knit together in fellowship and goodwill—each doing his best for the prosperity of the Company.

Next came a Workman-Director of the South Metropolitan Company, Mr. Henry Austin, who expressed his pleasure at hearing Mr. Hunt's testimony in favour of the Workman-Director. As to co-partnership, it had fed and clothed him, and others as well. Long would the name be remembered and cherished of him who had contributed so much to make life pleasant and enjoyable, by raising them to the condition that Mr. Hunt had spoken of. He was exceedingly pleased with what Mr. Hunt had said about the actual stock and deposits of the South Suburban men being £1000 more than they had received by way of bonuses. The South Metropolitan employees had set the example by showing what they could do. They had no difficulty in getting co-partners to take up stock; their trouble often was in finding sufficient stock to meet requirements. There was no standard by which to measure the value he placed on co-partnership.

The South Suburban Company were next represented by Sir Fortescue Flannery, a member of the Board, who said he had now been associated with co-partnership for about eight years—relying upon one strong character, one friend whom he regarded (as everyone who knew him regarded him) as a leader, as a guide, and as a man to be followed as well as loved. Now, for the first time in the history of co-partnership that presence was removed from them, that voice was silent, that kindly face was no longer seen. When the Board of his Company had to consider recently whether or not this dinner should be continued, one of the first questions they all asked themselves was, What would he have wished? As they had always been absolutely guided by his opinion and his judgment while he was alive, they felt they could not do better than be guided by what they believed would have been his opinion had he been still with them. They all felt he would have said that the men and women who had benefited by his great social, and as they believed enduring, reform should meet together after his death in friendly intercourse, just as they did during his lifetime. They had carried out this idea, in the confident assurance that they were going forward in the same direction in which he had led them, and that they would continue to go forward for many years—indeed for the whole of their lives. He

did not limit the progress of this great movement to the lifetime even of the present generation. He had ventured to say at other gatherings of this kind that the needed social reform of this age had begun in co-partnership, and that he did not think there could ever be a solution of the difficulties between Capital and Labour except the one which was established by Sir George Livesey. They were there that day not merely for a social purpose. They were assisting to carry forward this great movement which, as he believed, would harmonize the contending claims of Capital and Labour, of employer and employed, and which would do much towards destroying the movement that was going on at the present time in favour of setting class against class. They felt confident that prosperity throughout the country must be the prosperity of all, and not of one class or one kind of the people, whoever they might be. So he repeated, as the Chairman of the South Suburban Company had already repeated, that they in Lower Sydenham were just as confident to-day as they were before—and the same, he knew, applied to the South Metropolitan Company—and it was in this confidence of doing something for the generation in which they lived, helping to leave the world a little better than they found it, that they had met now, and would look forward to future meetings. Not for a moment would they forget the memory of him who was the foundation of this movement. His name would ever be revered by them; and his personality would ever be cherished in loving and affectionate remembrance.

Mr. W. G. Waller, a Workman-Director of the South Suburban Company, expressed his great gratitude for all that co-partnership had done, and said he was sure the employees would do all in their power to make the scheme successful. It had been very gratifying during recent months to see so many gas companies adopt co-partnership; and it was to be regretted that the colliery proprietors had not gone in for the same thing. He need not say how deeply they all felt the loss of their friend Sir George Livesey. That was clearly illustrated on Oct. 10 last. He was sure the South Suburban employees would perpetuate his memory by erecting a memorial to his memory; and he pledged them to continue to go in the right direction, as they had done in the past.

Mr. F. Seage, of the Old Kent Road works, proposed a hearty vote of thanks to Mr. Carpenter and the Directors of the two Companies for their kindness in inviting them to the dinner, and remarked that he hoped the time was very far distant when these gatherings would cease. Though they deplored the loss of their late Chairman, in Mr. Carpenter they had a gentleman they could thoroughly trust. They always felt that they could go to him and obtain justice; and they ought all to feel proud of him. Mr. Waller had referred to the companies who had adopted co-partnership within the past twelve months. He had noticed in connection with one of the big London Companies that, in the course of the discussion preceding the adoption of the system, one gentleman who opposed it said it would require a microscope to find the benefit which it had done the workmen in the companies who had adopted co-partnership. Well, he thought if this gentleman had been present that day he would tell a different tale. He would not need spectacles to see the benefit it had done them.

Mr. Middleton, who spoke to the proposal, remarked that such occasions as these brought masters and men into closer relationship with one another.

The motion was also supported by a South Suburban employee, and carried with applause.

In thanking those present, on behalf of the Directors of both Companies, for the vote, Mr. Carpenter remarked that it would be matter for great regret if anything happened to prevent the continuity of these dinners; but he did not for a single moment imagine that anything would happen. They were, however, all sure that, dinners or no dinners, co-partnership was established on such a firm and solid foundation that nothing except progress could be the future of it. The amount of the holding of the South Suburban employees had been mentioned. Of course, the South Metropolitan Company was larger, and the scheme had been in operation longer. Their employees' holding was £419,000, which included what he might call the property held by them, not only in stock, but also in houses which they had bought through the Building Society, but out of what they might call co-partnership profits. So that adding the two Companies' amounts together, they were getting on towards half-a-million of money. If this was not a satisfactory result after twenty years of co-partnership, he would like to know what would be.

The Secretary of the South Metropolitan Company, Mr. F. M'Leod, said there was no doubt some people thought they were possessed by the one idea of co-partnership; but while they might hold to the idea very strongly, it did not follow it was the only thing which interested them. It was peculiarly true of the employees of the two Companies represented there that day, that there was nothing worth doing which they were not taking some active part in. They sent a good contingent to the South African war; they had a strong body of territorials; and many of the men were efficient members of the ambulance corps. Thus co-partnership, besides winning wealth, turned out good citizens. This was to the credit of the system, because, after all, the accumulation of money was not the only, and probably not the primary, advantage. There were certain other advantages of a moral character which turned out good Englishmen. Some of their men went to the Colonies; and he thought a good co-partner would make a good Colonist, so they were helping to extend the Empire with the proper sort of stuff. They all remembered Sir George Livesey presiding at the dinners on past occasions; and they would never forget his presence and his beneficence. But they had to bear in mind that they lived for the future; and they could best honour the dead by doing what they knew would be his wish if he were still with them. They had in Mr. Carpenter a worthy successor in every respect—a leader of whom they should be proud. He pledged them all that in future they would be as loyal to Mr. Carpenter as they were to his predecessor; and if they went on in this spirit, they would hand down to those who followed them a heritage of which they would be proud, and which would be as beneficial to their successors as they themselves had found it.

Mr. S. Y. Shoubridge, the Engineer of the South Suburban Company, said they were all grateful to the Directors for their kindness and generosity in inviting them there to meet their friends of the South Metropolitan Company and to enjoy such a bountiful repast. They missed the gracious presence and the familiar voice of the "founder of the feast," who was never so happy as when presiding over these gatherings; but they felt quite sure, by the continuance of these festivals, that his spirit had descended upon those who were following him in the conduct of these two great undertakings. Sir George Livesey would rejoice could he see that the good work he inaugurated was being carried on so prosperously by Mr. Carpenter and Mr. Hunt (into whose hands the direction of the two South London Companies had fallen since Sir George's death). They were all determined, as far as they could, to help these gentlemen, not only to maintain co-partnership on its present high level, but to advance it to the very highest point of efficiency which it was capable of attaining. In this way only could they show their real regard for the memory of the great man who was their benefactor and their friend.

Mr. Charles M. Ohren, the South Suburban Secretary, also spoke a few words of thanks.

The company then rose from the tables and betook themselves to the grounds; returning to the restaurant again later on for tea.

ELECTRIC STREET LIGHTING IN MAIDSTONE.

Reply to the Gas Company's Protest.

Some weeks ago, Mr. George Marsham, the Chairman of the Maidstone Gas Company, addressed a letter to the Mayor, protesting against a proposal to convert 158 of the public gas-lamps to electricity; and to this the Committee have now replied.

Mr. Marsham, in the course of his letter, said the proposal appeared to be an unnecessary step viewed from the standpoint of efficiency, and a costly one viewed from the standpoint of economy. Comparison between the double Osram lamps and the ordinary gas-lamps in the immediate neighbourhood showed that the gas-lamps were at least equal in efficiency; and the proposed new single Osram lamps would be of less illuminating power than the existing gas-lamps. In regard to the cost, the revenue to be derived by the electricity undertaking from these 158 public lamps was computed by the Electrical Engineer at £474 per annum (at £3 per lamp), as compared with £485 17s. (or £3 1s. 6d. per lamp), which had been the price charged by the Gas Company for many years past. In the figure of £474, only 1¼d. per unit was allowed for the current consumed; and this price was about ½d. below actual cost price, as analysis of the borough accounts for 1908 seemed to show. In order to effect this problematical saving of £11 17s. per annum, an outlay of £2050 was to be incurred in laying cables, purchasing the standards, and converting them into electric lamps. It had been stated that the present proposal would enable the Committee to reduce the current price of 363 Nernst lamps, now charged at £3 10s. per annum, to £3 per lamp. This could not be done on a business basis; and if the Highways Committee were charged only £3 a lamp, there must be a loss to the Electricity Committee. As showing the effect of electric lighting, attention was called to the following figures: For the last two years preceding the introduction of electric lighting, the average cost of public lighting was £2338 per annum. For the year ended March 31, 1908 (as shown in the printed Maidstone Corporation accounts), the cost was £3337—an increase of almost exactly £1000 a year, or over 42 per cent. "There has," said Mr. Marsham, "certainly been no improvement in public lighting at all commensurate with this increased expense." In conclusion, the letter urged that the matter of public lighting should be treated on business lines—namely, that the Corporation, on behalf of the ratepayers, whose money they were expending, should buy their illumination for the streets of the town in the cheapest market, consistent with efficiency.

The Electricity Committee, in their reply, after remarking that there is "very little in the arguments put forth against the Corporation carrying out this electric street lighting," proceed as follows: "Before dealing with the various points raised, it would be well to state that the proposition was considered by the Committee, who are business men, purely as a business undertaking; and after careful consideration, they decided that it was to the advantage of the electrical undertaking that it should be gone on with. The lighting effect given by an Osram lamp is certainly equal to that given by a gas-mantle; and it is to the advantage of the Osram lamp that its candle power remains practically constant throughout its life, while no one will deny that the candle power of a gas-mantle falls off very considerably as the mantle gets old. The paragraph as to the cost of producing electrical energy appears to have been written by someone who is not well acquainted with the many details of the cost of production of electrical energy, and misapprehends several of the vital factors connected with the subject. The Committee have had sufficient figures before them to enable them to decide that the selling price left a fair margin over the cost of production. With regard to the increased cost of public lighting, the Gas Company's letter says nothing as to the large number of additional lamps (both gas and electric) erected in the out-lying parts of the borough since the date when the cost of gas lighting was quoted; and with regard to the extra cost of street lighting, it is certainly a matter of opinion as to what value ought to be attached to the better lighting of the main thoroughfares. On this point, the opinion of the Gas Company can hardly be taken as unbiassed. From inquiries made, there are few traders in the High Street who would care to go back to the lighting of that thoroughfare as it was before the arc lamps were put up. In conclusion, the Committee submit that the saving to the town (as distinct from the Electricity Committee) will be at least £194 17s., made up by the reduction in price of the existing lamps, and the saving of the new ones; while the profit to the Electricity Committee in obtaining the additional lamps at the price to be charged is a substantial one. It should be pointed out that the town will be paying the Electricity Committee 1s. 6d. per lamp, or a total of £39 6s., less than they would be paying the Gas Company for an equal number of lamps; and the Committee can vouch that at the price charged there will not be a loss to the Electricity Committee as a trading concern, but a profit."

GASLIGHT AND COKE COMPANY'S ACCOUNTS.

[For Half-Yearly Report, see p. 302.]

The accounts of the Company for the six months ended June 30, to be submitted with the Directors' report on Friday, consist of the usual statements, from which we take the following particulars.

The statement of capital (stock) sets forth that the total paid up is £9,466,500; added on conversion, £12,176,565—total amount authorized, £21,643,065. Deducting the amount redeemed, £101,655, the total amount of the Company's existing capital powers is £21,541,410. The statement of loan capital stands thus: Total paid up, £2,844,000; added on conversion, £1,479,975; unissued, £750,000—total amount authorized, £5,073,975.

The capital account shows receipts (with premiums, £1,586,807 11s. 9d.) to the amount of £27,472,192 11s. 9d. The expenditure is shown in the following items:—

	£ s. d.	£ s. d.
Expenditure to Dec. 31, 1908		£13,508,491 5 10
Expenditure during the half year to June 30, 1909—viz.,		
Buildings and machinery in extension of works	£2,847 17 9	
New and additional mains and service-pipes	13,386 17 3	
Do. do. meters	13,680 6 1	
Do. do. stoves	15,298 0 7	
		45,213 1 8
		£13,553,704 7 6
By sale of surplus land	£1,658 18 2	
By depreciation of plant	5,391 5 8	
By depreciation of meters and stoves	40,817 13 7	
		47,867 17 5
Total expenditure		£13,505,836 10 1
Nominal amount added on conversion		13,656,540 0 0
		£27,162,376 10 1
Deduct amount of capital redeemed under Company's Act of 1903		101,655 0 0
		£27,060,721 10 1
Balance of capital account		391,471 1 8
		£27,452,192 11 9

The balance applicable to the redemption fund and to dividend on the ordinary stock is £773,195 18s. 8d.; and the following statement shows how it is proposed to appropriate it:—

June, 1908.		
£349,551	Net balance brought from last account	£423,323 17 11
416,434	Net revenue for the half year	349,872 0 9
£765,985		£773,195 18 8
10,000	Contribution to redemption fund	10,000 0 0
(£4 10s. 8d. p. ct.)	Dividend on the ordinary stock—	
£343,662	£4 13s. 4d. per cent. per annum on £15,141,545	353,302 14 4
25	Forfeiture for deficiency in illuminating power	..
£412,298	Balance carried to next account	£409,893 4 4

The following is the revenue account:—

Expenditure.

June Half Year, 1908.		£ s. d.	£ s. d.
	Manufacture of gas—		
£662,199	Coal, including all expenses thereon	583,697 2 7	
82,532	Oil ,, less value of oil tar	87,277 4 9	
37,680	Coke and breeze used in the manufacture of carburetted water gas	32,655 7 2	
15,033	Salaries of Engineers and other officers at works	15,005 8 4	
96,968	Wages	90,768 3 5	
17,054	Purification	12,319 19 3	
183,849	Repair and maintenance of works and plant, materials and labour, less received for old materials, £5336 15s. 8d.	175,127 14 8	
			996,851 0 2
	Distribution of gas—		
45,006	Salaries and wages of officers (including rental clerks)	46,887 16 10	
53,504	Repair and maintenance of mains and service-pipes, &c.	56,103 10 3	
52,089	Repair and renewal of meters	59,000 2 9	
48,371	,, ,, stoves	51,910 5 8	
31,045	Gas fittings, including labour (automatic meter supplies)	29,518 5 11	
			243,420 1 5
19,859	Public lamps—lighting and repairing	..	20,931 16 1
	Rents, rates, and taxes—		
5,859	Rents payable	5,913 9 0	
138,465	Rates and taxes	141,898 8 3	
			147,811 17 3
	Management—		
2,750	Directors' allowance	2,750 0 0	
202	Company's Auditors and Assistant	204 4 0	
8,167	Salaries of General Manager, Secretary, Accountant, and clerks	8,399 6 9	
23,018	Collectors and cashiers	22,448 17 [illegible]	
5,763	Stationery and printing	6,987 15 4	
6,437	General charges	7,914 16 8	
			48,704 19 11
..	Co-partnership for the half year	..	11,605 0 0
389	Parliamentary charges	..	1,396 13 0
1,375	Law charges	..	1,375 1 4
7,505	Bad debts	..	9,681 11 2
500	Depreciation fund for works on leasehold lands	..	500 0 0
24,714	Annuities to officers and workmen, including contribution to officers' superannuation fund	..	24,872 8 7
2,164	Workmen's compensation account	..	1,837 18 1
	Public officers—		
1,243	Gas Referees and Official Auditor	1,243 11 6	
617	Public testing-stations	664 1 5	
			1,907 12 11
£1,574,359			1,510,895 19 11
621,783	Balance carried to net revenue account		572,600 1 3
£2,196,142			2,083,496 1 2

Receipts.

June Half Year, 1908.		£ s. d.	£ s. d.
	Sale of gas—		
£1,482,772	Per meter, at 2s. 9d. and 2s. 5d. per 1000 cubic feet	1,454,310 12 0	
74,878	Public lighting and under contracts	74,065 6 5	
£1,557,650			1,528,375 18 5
29,029	Rental of meters (ordinary)	..	28,618 5 3
41,246	Rental of stoves	..	43,676 7 10
64,360	Rental of fittings	..	71,908 15 4
	Residual products—		
£327,794	Coke, less £37,985 7s. 7d. for labour, &c.	248,811 17 2	
21,384	Breeze, less £6406 17s. 2d. ,,	16,215 5 8	
52,155	Tar and tar products	48,301 2 3	
97,630	Ammoniacal liquor and sulphate of ammonia	92,605 2 2	
£498,963			405,934 7 3
£4,614	Rents receivable		4,652 7 1
280	Transfer fees		330 0 0
£2,196,142			2,083,496 1 2

The three statements relating to the reserve, insurance, and depreciation funds, stood as follows on June 30: Reserve fund, £66,942; insurance fund, £115,308; depreciation fund, £70,764.

The following statements relate to the working:—

Statement of Coal Used, &c.

Description of Coal.	In Store Dec. 31, 1908.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1909.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	223,780	741,955	848,860	2,055	114,820
Cannel	5,097	..	1,015	..	4,082
Total	228,877	741,955	*849,875	2,055	118,902

* In addition to this quantity of coal, 7,723,826 gallons of oil and 111,911 gallons of spirit were used during the half year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1908.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1909.
Coke—tons	21,278	536,836	116,388	410,277	31,449
Breeze—tons	1,967	82,288	12,459	70,487	1,309
Tar, from coal only—galls.	810,103	8,722,309	8,744,366	129,003	659,043
Ammoniacal liquor—butts	21,707	247,384	247,061	..	22,030

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).		
Thousands. *12,355,543	Thousands. 458,760	Thousands. 10,788,769	Thousands. 11,394,201	48,972
†12,270,924	463,857	10,705,241	11,314,934	49,043

* Including 2,748,772,000 cubic feet of carburetted water gas. † June half year, 1908.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the half year as follows: Coal, £83,308; oil and petroleum spirit, £44,931; coke, £15,807; tar and ammoniacal liquor and products, £70,457; and sundries, £228,183. The figures this time last year were: Coal, £118,574; oil and petroleum spirit, £55,319; coke, £29,399; tar and ammoniacal liquor and products, £80,925; and sundries, £222,171.

SOUTH METROPOLITAN GAS COMPANY'S ACCOUNTS.

[For the Half-Yearly Report, see p. 302.]

The following are the principal portions of the accounts of this Company for the six months ending the 30th of June.

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £418,671 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £96,451 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,328,820; nominal amount added by conversion (less premium), £2,996,520—total, £8,325,340. The items of expenditure are as follows:—

	£ s. d.	£ s. d.
Capital account to Dec. 31, 1908		£5,041,412 19 4
Expenditure during half year to June 30, 1909, viz.—		
New and additional mains and services	£1,001 5 8	
New and additional meters	1,040 9 5	
New and additional stoves	1,210 7 0	
	£3,252 2 1	
By sale of land	120 0 0	
		3,132 2 1
Total expenditure		£5,044,545 1 5
Balance		284,274 18 7
		£5,328,820 0 0
Nominal amount added by conversion, less premium		2,996,520 0 0
Total		£8,325,340 0 0

The following is the revenue account:—

Expenditure.

Manufacture of gas—		
Coal into store	£368,695 11 3	
Purification	9, 04 4 7	
Salaries of Engineers and Officers at works	13,169 6 10	
Wages (carbonizing)	51,109 9 1	
Repairs and maintenance of works and plant, less £3623 13s. 4d. received for old materials	96,818 17 6	
		£539,097 9 3
Co-partnership for twelve months to 30th June, 1909	£37,122 19 2	
Less on account	13,000 0 0	
		24,122 19 2
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes	£25,713 14 9	
Salaries and wages of officers, including rental clerks	19,459 11 10	
Repairing and renewals of meters	26,816 17 0	
Repairing and renewals of stoves	28,980 17 1	
Repairing and renewals of gas-fittings	31,669 10 1	
		132,640 10 9
Public lamps, including £16,717 0s. 2d. for labour and materials, less £15,800 0s. 8d. received for the same		916 19 6
Rents, rates, and taxes—		
Rents payable	£873 14 7	
Rates and taxes	45,608 5 7	
		46,482 0 2
Management—		
Directors' allowance	£2,837 15 0	
Salaries of Secretary, Accountant, and clerks	3,702 19 9	
Collectors { Ordinary	6,922 3 9	
Collectors { Slot meter	8,914 14 11	
Stationery and printing	3,032 0 3	
Livesey Professorship at Leeds Uuiversity	2,000 0 0	
General charges	7,788 3 1	
Company's Auditors	112 10 0	
		35,310 6 9
Law charges	£1,843 10 3	
Parliamentary charges	548 14 11	
		2,392 5 2
Bad debts		1,904 7 9
Stolen from 5417 slot meters broken open		576 13 6
Pensions and officers' and workmen's superannuation, sick, and accident funds		7,344 8 8
Gas Referees and Official Auditor		379 14 0
Leasehold renewal fund		300 0 0
Total expenditure		£791,467 14 8
Balance carried to net revenue account		262,490 11 1
		£1,053,958 5 9

Receipts.

Sale of gas—		
Lady-Day, at 2s. 3d. per 1000 feet	£404,525 5 3	
Midsummer, at 2s. 3d. per 1000 feet	275,534 15 7	
	£680,060 0 10	
Public lighting	17,485 11 9	
		£697,545 12 7
Meters in use (341,359)—		
Company's meters at rent: Ordinary, 97,486; slot, 235,617	£37,858 16 8	
Company's stoves at rent: Ordinary, 77,778; slot, 191,550; fires, 23,582	30,140 15 2	
		67,999 11 10
Residual products—		
Coke, less labour and cartage	£152,706 12 3	
Breeze, less labour and cartage	4,722 2 5	
Tar and tar products, less labour	34,382 11 1	
Sulphate of ammonia	57,599 1 9	
		249,410 7 6
Rents receivable		1,513 1 5
Transfer fees		88 7 6
Gas-fittings		37,401 4 11
Total receipts		£1,053,958 5 9

Total amount paid in salaries for half year, £35,405 9s. 2d.
" " " wages " £256,759 19s. 2d.

The net revenue account shows a sum of £238,190 3s. 2d. applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on June 30 were as follows: Reserve fund, £181,404; renewal fund, £29,062; insurance fund, £97,739. The amount written off the reserve fund for depreciation of investments, referred to in the Directors' report, is £10,614; off the insurance fund, £14,113.

Statement of Coal.

In Store December 31, 1908.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1909.
Tons.	Tons.	Tons.	Tons.	Tons.
114,765	596,486	570,075	791	140,385

Statement of Residual Products.

Description.	In Store Dec. 31, 1908.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1909.
Coke—cwt.	891,940	7,047,587	1,623,416	5,762,791	553,320
Breeze—yards	12,172	125,120	43,524	83,590	10,178
Tar—gallons	657,603	5,822,349	5,725,363	35,243	719,346
Ammoniacal liquor—butts	12,720	203,407	206,242	..	9,885

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
6,406,782	167,073	6,119,663	6,363,372	23,676 incandes't 11 flat flame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £77,211; coke and breeze, £14,083; tar, sulphate, and ammoniacal liquor, £36,778; and sundries, £288,911. The figures this time last year were: Coal, £62,179; coke and breeze, £16,023; tar, sulphate, and ammoniacal liquor, £45,465; and sundries, £290,272. A sum of £45,232, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £50,659. The figures last year were £36,359 and £47,162.

BRENTFORD GAS COMPANY.

Half-Yearly Report and Accounts.

In the report for the six months ending June 30, which the Directors will present at the ordinary meeting on Friday, they state that though the weather during a large portion of the half year was unfavourable for gas consumption, there was nevertheless an increase of 3·20 per cent. in the quantity of gas sold, and that the business generally is increasing. They report with satisfaction that the 30-inch main connecting the Southall and Brentford stations is now finished, and, together with a remodelled governor-house at Brentford, which is nearing completion, will be ready to meet and regulate the demands for gas during the ensuing winter. They say, however, that the works are still much overtaxed, and some reconstruction and the adoption of up-to-date appliances are absolutely necessary. To provide the necessary working capital, a further issue of the new stock (of 1881) in the autumn is contemplated. The Directors conclude their report with an expression of regret at the death, on the 16th of March last, of Mr. Howard Charles Ward, who had been for the long period of 58 years identified with the affairs of the Company. As already announced in the "JOURNAL," they have elected Mr. D. Milne Watson, the General Manager of the Gaslight and Coke Company, to fill the vacancy.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £185,307; from meter and stove rents, to £20,330; and from the sale of residual products, to £38,668—rents and transfer fees making up a total of £244,343, compared with £241,771 in the corresponding period of 1908. On the other hand, the manufacture of gas cost £126,326; distribution, £45,591; and management, £7888—the total expenditure being £197,976, against £200,672. The balance carried to the profit and loss account is £46,367, compared with £41,099 this time last year. The amount available for distribution is £88,959; and the Directors recommend the declaration of the usual dividends at the rates of 5, 12½, and 9½ per cent. per annum on the preference, consolidated, and new stocks respectively.

The working statements show that 86,121 tons of Newcastle coal and 1,297,380 gallons of oil were used in the production of 1,436,432,000 cubic feet of gas (including 482,691,000 cubic feet of carburetted water gas), of which 1,342,560,000 cubic feet were sold and 1,364,560,000 cubic feet were accounted for. The estimated production of residual products was: Coke, 53,646 tons; breeze, 6691 tons; tar, 1,237,259 gallons; ammoniacal liquor, 24,293 butts.

SOUTH SUBURBAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors for the six months ending the 30th of June, which, with the accounts, will be presented at the half-yearly general meeting on Friday.

To the great regret of all his colleagues, Mr. Robert Morton declined to be re-elected as Chairman on the termination of his period of office. The Directors have placed on record their high appreciation of his valuable services during the time that he occupied the chair, and unanimously elected Mr. Charles Hunt to succeed him as Chairman.

There has been an increase in the gas sales of about 2½ per cent. This is satisfactory, having regard to the increasing use of more economical burners by consumers, and also to the keen competition which gas has now to meet. Encouragement is given to the use of the most economical methods of using gas, not only for lighting but also for heating and cooking.

The receipts for gas show a falling off of £1818, as compared with those of the corresponding half year; this being due to the reduction of price which was made last year. The returns for residuals are also less by £6268—coke, tar, and ammonia all contributing to this result. On the other hand, coal and other items of expenditure show considerable improvement, due partly to reduction of prices and partly to a notable advance in carbonizing methods. The net result is an increase of profit of £1162.

The balance of profit available for dividend, after placing £4500 to the insurance fund, is £28,407; and the Directors recommend a dividend at the rate of 5 per cent. per annum on the 5 per cent. preference stock, and at the rate of 5½ per cent. per annum on the ordinary stock—this being the full amount authorized under the sliding-scale.

A supply of coal for the ensuing twelve months has been secured at a small reduction of price; and the Directors have had the satisfaction of announcing a further reduction in the price of gas to 2s. 5d. per 1000 cubic feet, to take effect from Midsummer last. This brings the price down to the level reached before the advance in price two years ago.

Mr. Robert Wyllie, having retired from the service of the Company, has vacated his position as Employees' Director; and Mr. George Ross, foreman fitter, has been elected by the employees in his place, and has already proved himself to be a very useful Director. This participation of the employees in the responsibility of management has proved to be one of the most gratifying features of the system of co-partnership; for it contributes materially to the maintenance of the satisfactory relations which the Directors are glad to report continue to exist between them and all classes of the Company's employees.

The accounts accompanying the report show that the total capital

expenditure on the 30th of June was £802,424, or £28,869 less than the receipts, including the premium capital—£831,363 in all. The net revenue from the sale of gas was £86,227; the rental of meters and stoves produced £6453; the sale of residuals, £26,647; and a small item of rents brought up the total receipts to £119,368. The following were the principal items of expenditure: Manufacture of gas (including £46,922 for coal and £13,270 for maintenance of works and plant), £66,540; distribution, £13,178; management, £5040—rents, rates, and taxes (£4764) and miscellaneous items bringing up the total to £93,154. Among these items is a sum of £1602 charged on account of the co-partnership scheme. The balance carried to the net revenue account is £26,214; and the amount applicable for dividend is £28,407.

The statements as to working show that 62 838 tons of coal were carbonized in the half year. The quantity of gas made was 727,763,000 cubic feet, of which 702,846,000 cubic feet were sold and 711,874,000 cubic feet accounted for. The residuals were: Coke, 754,056 cwt., of which 155,366 cwt. (estimated) were used in manufacture; breeze, 19,130 yards; tar, 614,462 gallons; ammoniacal liquor, 14,196 butts—the make of sulphate of ammonia being 587 tons.

TOTTENHAM AND EDMONTON GAS COMPANY.

Half-Yearly Report and Accounts.

At the Annual Ordinary General Meeting of the Company on Saturday, the Directors will report an increase of 8·31 per cent. in the sales of gas in the six months ending the 30th of June, compared with the corresponding period of 1908. There was an addition during the twelve months of 4072 consumers, and an increase of 7927 in the number of cooking and heating stoves. The accounts accompanying the report show that £16,554 was expended on capital account in the half year; £10,102 being for new mains and service-pipes, including laying and other work connected with distribution. The sale of gas produced £88,507; the rental of meters, stoves, and fittings and the maintenance of incandescent mantles, £14,449; residuals brought in £17,968; and the total revenue was £120,962. The expenditure on the manufacture of gas was £68,246, including £33,833 for coal, £12,228 for oil and coke used in making water gas, and £14,969 for the repair and maintenance of works and plant; on distribution, £20,574; on management, £4150; and for the co-partnership scheme, £1300—the total expenses being £102,185, leaving £18,777 to be carried to the profit and loss account. The amount available for distribution, with £18,552 brought forward, is £33,649; and the Directors recommend the payment of the full statutory dividends of 6⅞ and 5⅜ per cent. per annum on the "A" and "B" stocks. This will absorb £15,057, and leave £18,592 to be carried forward. The higher dividends recommended are due to the reduction in the price of gas which took effect on Jan. 1 last.

The working statements in the account show that 41,357 tons of coal and 688,169 gallons of enriching oil were used in the production of 747,476,000 cubic feet of gas, of which 725,018,000 cubic feet were sold and 738,942,000 cubic feet accounted for. The residual products were: Coke, 24,814 tons 4 cwt., of which 6703 tons 11 cwt. were used for making coal gas, and 5366 tons 5 cwt. for producing carburetted water gas; breeze, 6172¾ chaldrons; tar, 540,433 gallons; and ammoniacal liquor, 11,488 butts. The quantity of sulphate of ammonia made in the half year was 367 tons 6 cwt. 2 qrs. 6 lbs.

Improved Incandescent Gas Lighting in Lambeth.

At the meeting of the Lambeth Borough Council last Thursday, a letter was received from the South Metropolitan Gas Company, stating that, as the result of experiments with a new inverted burner designed especially for street lighting, they were able to make a substantial reduction in the yearly charge. Hitherto this has been at the same rate as the No. 4 burner; but the Company will now, by the reduced cost of upkeep and the lower charge for gas, reduce this figure to £2 19s. 6d. As the new burner gives a light of 120 candles compared with 80 candles for the No. 4 burner, the reduction in the cost of lighting by its use will be very considerable, especially as the charge made for converting a lamp with a No. 4 burner to the inverted pattern is only 3s. By reason of the lower price of gas which came into operation at Midsummer, the charges for Nos. 2, 3, and 4 burner lamps will be reduced by 11d., 1s. 3d., and 1s. 7d. respectively; that is to say, to £2 8s. 3d., £2 15s. 6d., and £3 2s. 10d. The letter went on to suggest that, in view of the saving to be effected by replacing the No. 4 burner by the new inverted type, the Council might, in addition to converting these burners, think it desirable to make a similar change in respect of some of the No. 3 burners. Should this be done, the cost of conversion would be the same as in the case of the No. 4 burner. The Lighting Committee reported that there were at present in the Company's district 670 lamps with No. 4 burners which were not inverted, with two additional lamps which were alight day and night. The cost of converting these to the inverted pattern and fitting burners, at 3s. per lamp, would be £100 16s. But in the first complete year, even after allowing for the payment of this cost, there would be a saving of 4d. per lamp, less 5 per cent. discount; while after the first complete year there would be a saving of 3s. 4d. per lamp per annum, less 5 per cent. There were 88 lamps fitted with No. 3 burners; but as there would be an increase in the present charges if the inverted burners were fitted in these lamps, the Committee did not consider that any action should be taken with regard to same. It was resolved to accept the offer of the Company with regard to the conversion of the lamps fitted with No. 4 burners.

At a meeting of the Directors of Messrs. C. & W. Walker, Limited, held in Birmingham last Thursday, it was resolved to pay an interim dividend for the six months ended July 31 at the rate of 5½ per cent. per annum, less income-tax, on the cumulative preference shares, and on the ordinary shares at the rate of 10 per cent. per annum, free of income-tax. These dividends are the same as those declared a year ago.

MANCHESTER CORPORATION GAS UNDERTAKING.

Annual Report and Accounts.

We have received from the Superintendent of the City of Manchester Gas Department (Mr. F. A. Price) the report and accounts of the Gas Committee for the year ending March 31; and from them the following particulars have been gathered. The report bears the signature of Alderman R. Gibson, the Chairman of the Committee.

The quantity of coal and cannel carbonized (including the equivalents of enriching materials) was 514,446 tons, compared with 527,891 tons in the previous year; the quantity of gas made per ton being 10,962 cubic feet, against 10,948 cubic feet. The residual products made per ton of coal were: Coke, 13·45 cwt.; tar, 11·41 gallons; ammoniacal liquor, 28·52 gallons. The quantity of gas sent out from the works (5,638,451,000 cubic feet) shows a decrease of 139,065,000 cubic feet, or 2·41 per cent., compared with an increase of 187,610,000 cubic feet, or 3·36 per cent., the preceding year. The quantity of carburetted water gas produced during the year was 1,125,745,000 cubic feet, compared with 1,164,117,000 cubic feet the previous year. In the production of this gas 2,541,571 gallons of oil and 24,039 tons of coke were used, against 2,709,355 gallons and 23,990 tons respectively for the year ending March 31, 1908. The illuminating power of the gas sent from the works, as tested by the "Metropolitan" No. 2 burner, was 17·72 standard sperm candles. The unaccounted-for gas was 3·24 per cent., which compares with 3·54 per cent. for the previous year.

The number of consumers on March 31 was 174,290, of whom 23,160 were outside the city. The previous year the number was 170,938, of whom 22,286 were outside the city. The total increase was thus 3352. Of the consumers, 58,041 use prepayment meters. This compares with 56,368 in the previous year—an increase of 1673; and of this increase 1371 were fixed in the city and 302 in the out-townships. The quantity of gas passed by these meters was 526,852,000 feet—an increase of 8,784,000 feet, or 1·69 per cent., on the previous year. The meters were inspected once in every five weeks; and the amount collected during the year was £74,041 9s. 10d. This is represented by 17,769,958 pennies, weighing 158 tons 13 cwt. 0 qr. 23 lbs.

The number of gas-cookers owned and fixed by the Committee at March 31 was 46,391, compared with 41,456 for the year ending March, 1908. The total quantity of gas that was consumed by cookers is estimated at 613,000,000 cubic feet—being an increase of 43,000,000 feet, or 7·54 per cent., on last year's figures. There have also been fixed 30,724 grillers in connection with prepayment and small ordinary meters. About 44 per cent. of the consumers now have the free use of a cooker or griller. On March 31 last, the number of gas-engines in use was 1733, compared with 1741 in the previous year. The quantity of gas consumed by these engines was 390,637,000 cubic feet—a decrease of 35,493,000 feet, or 8·33 per cent. The cost of coal, cannel, and oil per ton carbonized was 11s. 9·14d., against 11s. 4·17d. for the previous year—an increase of 4·97d. per ton, which, on the total carbonization of 514,446 tons, amounts to £10,653.

The total income was £761,363, against £782,690; and the expenditure £621,341, against £618,702. The gross profit on the year's working was £140,022, out of which the sum of £50,149 was paid for interest on loans, &c. The net profit therefore amounted to £89,873, compared with £116,181 in the previous year. This sum, together with £42,732 transferred from reserve—making together £132,605—has been appropriated as follows: To the sinking fund for redemptions of loans, £63,766; paid over to the city fund, £60,000; extension of carburetted water-gas plant £391; general extensions (wages), £7751; purchase of consolidated 4 per cent. stock for cancellation, £697.

During the year, the construction of 18 beds of inclined retorts in No. 2 retort-house at the Gaythorn station, forming the second section, so far progressed that they will be available for gas making during the ensuing winter. This completed retort-house is now the largest belonging to the Gas Department. It contains 36 beds of retorts, or 576 mouthpieces; and it will be capable of carbonizing 400 tons of coal and producing upwards of 4½ million cubic feet of gas per diem. The entire removal of the "C" section purifiers opened out much desirable space between the meter-house and the washing and scrubbing plant. Old workshops and stores at the Rochdale Road station were demolished, and preparation was made for the arrangement of the space for the disposal of coke in small quantities through a new entrance to the station. The No. 2 gasholder, which has been in use more than forty years, has been resheeted. Good progress was made at the Bradford Road station with the construction of the new gasholder tank; the brickwork having been completed. The gable wall of No. 1 retort-house, which had become unsafe through the expansion of the retort-bench, was rebuilt in such a manner that there will be no difficulty through this action in the future. During the year, several improvements and rearrangements were effected in the plant at the chemical works, which will conduce to further economies in the manufacture of sulphuric acid and sulphate of ammonia. The total length of mains now laid is 1,628,780 yards, or 925¼ miles and 340 yards; being an increase of 12¾ miles and 67 yards during the year. The number of public lamps within the city is 18,704, and outside the city 2349—a total of 21,053. The incandescent system of lighting has been applied to all the lamps within the city; and the number of burners fixed thereto is 25,161.

The following are the principal items in the accounts:—

REVENUE ACCOUNT.

INCOME.

Gas-rental—		
Ordinary meters		£499,876 4 5
Prepayment meters		74,041 9 10
Public lamps		41,453 15 5
Residual products—		
Coke	£87,846 3 0	
Tar	22,581 16 2	
Sulphate of ammonia	34,235 7 7	
Carbon	515 7 8	
		145,178 14 5
Rents of cottages, &c.		813 8 1
		£761,363 12 2

EXPENDITURE.

Manufacture—		
Cannel, coal, and oil (including cost of unloading, &c.)	£302,551 8 1	
Coke, water, &c. (carburetted water gas)	8,473 6 2	
Carbonization (wages)	45,217 8 0	
Purification (less sales of spent material, £6025 5s. 3d.)	471 14 0	
Retorts, fire-bricks, &c.	9,031 11 2	
Repairs and maintenance of works, &c.	42,961 13 7	
Salaries of Engineer and works staff (less proportion transferred, £1959 3s. 6d.)	6,355 10 10	
	£415,062 11 10	
Provision for renewal of works plant (less £1207 1s. 8d. charged to sulphate of ammonia)	19,739 0 0	
		£434,801 11 10
Distribution—		
Repair and maintenance of mains, services, meters, and stoves	£34,962 2 1	
Salaries (less proportion transferred, £300)	26,166 9 6	
	£61,128 11 7	
Provision for renewal of distribution plant	46,551 0 0	
		107,679 11 7
Rents, rates, and taxes		52,007 13 8
Management—		
Salaries	£16,013 14 3	
General charges	5,819 12 8	
		21,833 6 11
Law and parliamentary charges		960 6 3
Subscriptions and donations		2,985 15 9
Bad debts		1,073 5 5
		£621,341 11 5
Balance carried to profit and loss account		140,022 0 9
		£761,363 12 2

The accounts (which are signed by Mr. Charles Nickson, who has just retired from the position of Superintendent) are followed by the usual appendices, furnishing particulars in regard to the progress of the undertaking.

Appendix A is an abstract of the capital, revenue, and profit and loss accounts. It shows (*inter alia*) the amount of gross profit made from the gas undertaking, and the mode of its appropriation, also the amount of borrowed money owing, excess of assets, &c., from March 31, 1889, to March 31 last. The figures for the past financial year are as follows: Gross profit, £141,374; net profit, £89,873; contributed to sinking fund for redemption of debt, £63,766; paid over for improvement purposes and city fund, £60,000; applied in extension of works, £8839; borrowed money owing, £1,226,058; and excess of assets, £1,671,108. From June 24, 1843, the date when the works were taken over by the Corporation from the Commissioners of Police, the gross profits on the gas undertaking have amounted to £6,060,323, out of which £1,466,606 has been paid for interest—leaving a net profit of £4,593,717. Of this total, £1,468,844 has been placed to the sinking fund, £2,589,383 has been handed over to the Improvement Committee and added to the city fund, £329,202 has been paid for street lighting (making £2,918,585 used in relief of the rates), and £207,241 applied to extensions of works.

Appendix B is a comparative statement of the gas transmitted from the works in the daytime and during the twenty-four hours, for the past two years. Summarized, the figures are as follows:—

	Daytime. Cubic Feet.	Twenty-four Hours. Cubic Feet.
Year ended March 31, 1909	1,869,399,000	5,638,451,000
Do. Do. 1908	1,901,857,000	5,777,516,000
Decrease	32,458,000	139,065,000

	Cubic Feet.
Gas transmitted from the works	5,638,451,000
Do. accounted for	5,455,725,000
Loss (by condensation and leakage)	182,726,000
	or 3·24 per cent.

In Appendix C, particulars are given as to the results of the working from March 31, 1889, to March 31, 1909. The table contains statistics as to the number of tons of coal and cannel carbonized, the total make of gas, the percentage unaccounted for, the yield per ton of coal, the illuminating power of the gas, the quantity of residual products, &c., each year in the above-mentioned period. The particulars for the past financial year are as follows: Coal and cannel carbonized, 514,446 tons; gas made, 5,639,380,000 cubic feet; yield per ton of coal carbonized, 10,962 cubic feet; illuminating power, 17·72 candles; quantity sold, 5,380,025,000 cubic feet; quantity sold per ton, 10,458 cubic feet; percentage of output unaccounted for, 3·24; coke for sale, 211,855 tons; do. per ton of coal, 10·30 cwt.; make of tar, 27,986 tons; do. per ton of coal, 11·41 gallons; ammoniacal liquor (10-oz. strength) made, 11,734,961 gallons; do. per ton of coal, 28·52 gallons; sulphate made, 4224 tons; do. per ton of coal, 22·40 lbs.

Appendix D shows the number of stoves and of each size of meter in use during the year in the city and out-townships. At the close of the past financial year, there were 39,359 stoves within, and 7032 beyond, the city—together 46,391, compared with 35,076 and 6380 (together, 41,456) at the corresponding date in 1908; so that there was an increase of 4935. The number of meters in use was 174,290 in 1909 and 170,938 in 1908. There was last year a net increase of 3352 on the number for the preceding year. The number of prepayment meters in use on March 31 last was 58,041—an increase of 1673 on the number at the close of the preceding year.

From Appendix E, we learn that the gas-mains laid last year within the city extended to 26,978 yards, and beyond the city to 5786 yards; being 18¼ miles and 67 yards. The mains taken up were 8285 and 1972 yards respectively—a total of 10,257 yards, or 5¾ miles and 137 yards. The total net increase during the year, therefore, was 22,507 yards, or 12¾ miles and 204 yards. The total length of mains on March 31 last was 1,628,780 yards, or 925¼ miles and 340 yards.

HALIFAX CORPORATION GAS ACCOUNTS.

The accounts of the gas undertaking of the Halifax Corporation for the year ended the 31st of March have lately been issued, and we have received a copy from the Gas Engineer and Manager (Mr. J. Wilkinson, F.C.S.). They show that the net revenue from the sale of gas was £80,777; meter-rents produced £2311; residuals, £25,669; and the total receipts were £110,242. The expenditure on the manufacture of gas was £43,252; on the maintenance of works, £8825; on distribution, £5683; on gas-stoves, £1735; and on management, &c., £5246—the total expenses being £71,433; leaving £38,809 to go to the profit and loss account. For the preceding year, the revenue was £115,987, the expenditure £75,243; and the gross profit, £40,744. The total amount on the net revenue account is £40,247; and £18,643 of it is taken for interest, £8925 for the sinking fund, £100 for the final instalment of the expenses connected with the Corporation Act of 1898, and £1045 for income-tax—leaving a balance of £11,534. This, added to the amount carried forward from March 31, 1908, makes a total of £25,889, which is thus disposed of: Transferred to the borough fund account in aid of the rates, £6000; to the district fund, do., £3000; to the reserve fund, £3616; making together £12,616, and leaving £13,273 to be carried forward. The bulk of coal carbonized was 72,843 tons, and 30,400 gallons of oil were used. The quantity of gas made was 823,998,000 cubic feet, of which 774,010,300 cubic feet were sold; the unaccounted-for gas being 40,614,400 cubic feet, or 4·91 per cent. The total receipts were 25·05d., the total cost of gas was 21·41d., the accident insurance fund came to 0·07d., and the balance of profit 3·57d. per 1000 cubic feet of gas sold.

BARRY GAS AND WATER UNDERTAKINGS.

The Past Year's Working.

The Manager of the gas and water undertakings of the Barry Urban District Council (Mr. T. E. Franklin) has presented his report on the working in the past financial year; and at a recent meeting of the Gas and Water Committee it was decided to have it submitted to each member of the Council prior to its consideration at the next meeting.

In the course of his report, Mr. Franklin says there was an increase of £1019 in the capital expenditure, caused mainly by the erection of two new beds of inclined retorts, without which the supply of gas could not have been kept up. There was a decrease of £619 in the revenue account compared with the year 1907-8 (£31,872 against £32,491), owing to a reduction in the price of gas and to a smaller return from residuals. With regard to expenditure, extra outlay was incurred for the maintenance of works and plant; the amount spent being £995 more than in the preceding year. But good value for it has been received, as the whole of the plant has been more or less renovated and put into something approaching fair working order. There was a decrease of £754 in the expenditure for coal. The gross profits are £659 less, and the net profits £354 less, than before; the figures being £3619, against £3973. The make of gas was 158,156,000 cubic feet, or 9,358,000 cubic feet more than in 1907-8 with only 200 tons more coal used; and the quantity sold was 153,649,750 cubic feet—an increase of 10,575,201 cubic feet. The quantity of gas unaccounted for was about 1½ millions lower than before, and shows the extremely low proportion of less than 0·4 per cent. of the make, assuming the station meter to be registering correctly. The average make of gas per ton was 10,069 cubic feet—an increase of 474 cubic feet, due to the erection of a tar-tower, the working of the governors, and alterations made in the hydraulic mains. In the first six months of the year, these improvements had not been made.

In the Water Department there was an increase of £67 in the rentals; the amount received being £9528 against £9461. The waste of water was materially reduced by more frequent inspections, washering taps, and serving notices for the repair of defective fittings. In addition to 7424 calls, Mr. Franklin had one complete house-to-house inspection made, and another was about half finished at the end of the financial year. The gross profits were £5106, against £4730; and the deficiency for the year is lower by £1162 (£2749, against £3911).

The net profit on the gas undertaking being £3619, and the net deficiency on the water undertaking £2749, the net profit is £870. But Mr. Franklin explains that had the price of gas not been lowered in January last year, this amount would have been increased by upwards of £3000; and if coke had not been reduced 3s. 4d. per ton it would have been more than £3600. The net profit is the highest on record.

Reduction in Price at Bath.—The Directors of the Bath Gas Company have reduced the price of gas 1d. per 1000 cubic feet; bringing it down to 1s. 11d.

Improperly Using Gas.—Edward Morgan, a Bolton plumber, was recently fined 10s. and costs for improperly using gas. Mr. Bradbury, who prosecuted, said the meter had been left coupled up in the ordinary way with the service-main, and it was found that the defendant had disconnected the service-pipe, so that the gas had not passed through the meter, and the Corporation officials could not tell what amount had been used. But the Corporation fitter found out that the tenant had been nearly suffocated the previous day, so that he must have used a considerable quantity. The Gas Committee regarded the offence in a serious light. The defendant said he was looking for a gas escape; but Mr. Bradbury remarked that he had no right to find an escape in this way, as it could be done by a very simple process.

COMPLETION OF THE CARLISLE WATER SCHEME.

Opening of the Castlecarrock Reservoir.

Though the citizens of Carlisle have for months been in possession of a water supply from the Geltsdale Valley, it was not until last Thursday week that the water was turned into the great reservoir at Castlecarrock. This forms the practical completion of the Carlisle water scheme, which has cost the city something like £275,000. It is twelve years since the Town Council determined to go to Geltsdale for a gravitation water supply to take the place of the old scheme of pumping from the River Eden; and the construction of the reservoir at Castlecarrock has been a work which involved a good deal of controversy and not a little anxiety to all concerned. The contract for the reservoir was let in 1905 to Messrs. Arnold and Sons, of Leeds and Doncaster; the amount of their tender being £61,733. It has always been recognized that the construction of this reservoir, and more especially of the great dam which forms one side of it, where the depth of water is greatest, was the *crux* of the scheme from the engineering point of view: and some fears were entertained lest the Engineers (Messrs. James Mansergh and Sons) might have a difficulty in finding a solid foundation for the mass of masonry and concrete. These misgivings have happily proved unfounded. About two years ago, Mr. Ernest Mansergh was able to report to the Corporation that a good foundation on the rock had been obtained at a depth of 130 feet; and since then the work has proceeded without any serious hitch or interruption. The reservoir has a top-water area of 43 acres, a maximum depth of water of 33 feet, and a capacity of 170 million gallons above the lowest draw-off level. At the time of the opening, it was filled to the extent of 6 feet below the overflow level; and it had the appearance of a small lake measuring about five-eighths of a mile long and 800 feet wide from bank to bank.

The members of the Corporation, the chief officials, and a few invited guests, assembled at the Town Hall, where motor-cars and carriages were in waiting to convey them to Castlecarrock. On arriving at the reservoir, Sir Benjamin Scott, the Chairman of the Water Committee, invited the Mayor (Mr. W. B. Maxwell) to perform the inaugural ceremony by raising one of the valves in the valve-tower. His Worship complied, and the water poured into the filter-beds amid the cheers of the company. He then formally declared the reservoir open, and by so doing brought into use part of what he characterized as the most important undertaking with which Carlisle had ever been concerned. It had been carried out at immense cost; but he was one of those who held the opinion that the benefits of a plentiful supply of pure and wholesome water to any community could not be measured in pounds, shillings, and pence. The Corporation were deeply indebted to the Engineers, particularly the late Mr. James Mansergh, who, from local connections, was very much interested in Carlisle; to Mr. Ernest Mansergh, the present head of the firm, upon whom the responsibility for the success of the undertaking had fallen, for the care and attention he had given to it; to the Contractors, who set about their work with spirit, and had successfully carried it out without friction; and last, but not least, to Mr. Wilfrid Lewis, the Resident Engineer in charge of the work, to whose ability, industry, and attention in the discharge of his duties the Water Committee at their last meeting paid a high tribute.

Mr. Ernest Mansergh then addressed the assembly. He congratulated the Corporation and the citizens of Carlisle on having in their possession a water supply which, in his opinion, was second to none in the country. It was pure water, of a quality which was undoubted, a very soft water, and therefore adaptable to all domestic as well as to manufacturing purposes; and there was plenty of it. Though the estimates which were made years ago had been far exceeded, the water as supplied to-day was not expensive as waters went. They also possessed a fine storage reservoir, which he thought he might say with perfect certainty was absolutely water-tight. His personal relations with the Water Committee and all the officials and the members of the Corporation had been most pleasant; and he thanked them very heartily. He should like to congratulate Messrs. Arnold and Son on the business-like way in which they had tackled their job. Finally, he wanted to address a few words of thanks to Mr. Lewis, the Resident Engineer, who had seen the work through from beginning to end. He could only say that Mr. Lewis had carried out his duties most efficiently and energetically. Messrs. Mansergh had always trusted implicitly to his judgment, and with good reason; for, whenever there had been any difficulty, Mr. Lewis had not only let them know about it, but had always had some valuable suggestions to make as to the way of getting over the trouble. This, in his opinion, was what the resident engineer ought to be. Finally, he would like to congratulate the Mayor on being concerned in the final stages of this great undertaking; and, on behalf of his brother and himself, ask his Worship's acceptance of a memento of a very auspicious occasion, with his hearty good wishes for his health and prosperity for many years to come. He then presented the Mayor with a handsome rose bowl of silver plate, mounted on an ebony stand, and bearing the following inscription: "Carlisle Corporation Water-Works: Geltsdale Scheme. Presented to W. B. Maxwell, Esq., Mayor of Carlisle, by the Engineers, Messrs. James Mansergh and Sons, on the occasion of the Inauguration of the Castlecarrock Reservoir; 22nd July, 1909."

Mr. Harold Arnold, on behalf of himself and his son, then asked the Mayor to accept a silver salver from them, to commemorate the completion of what he felt was a great undertaking, which would be of considerable benefit to the citizens of Carlisle, and to its trade and commercial concerns. The salver bore the following inscription: "Carlisle Water-Works. Presented by the Contractors to W. B. Maxwell, Esq., Mayor, on the completion of the Castlecarrock Reservoir; July 22nd, 1909."

The Mayor, in returning thanks for the gifts, said he should always treasure them, not only because they bore witness to his connection with the Corporation, but also to his association with the great work now completed.

A hearty vote of thanks was then accorded to the Mayor, who briefly acknowledged it, and invited all present to take luncheon with him. A pleasant feature of the subsequent proceedings was the presentation by Sir Benjamin Scott, on behalf of the Water Committee and himself, of a silver salver to Mr. Lewis, as a memento of his work in Carlisle. Mr. Lewis, in accepting the gift, said he was proud to receive it as a mark of the appreciation of the Water Committee of his services as Resident Engineer under Messrs. Mansergh. The company afterwards separated to inspect the works.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual meeting of the North British Association of Gas Managers at Stirling on Thursday was a gathering of which there can only be pleasant memories. It was very large, the company numbering considerably over a hundred. It is difficult to determine what was the impelling power which brought so many of the members together. It was not the wealth of technical fare provided, for it was not by any means of the first water; the topics put down for discussion being quite within the designation of a work-a-day nature. The personality of the President—Mr. J. D. Smith, of Stirling—probably went a long way in attracting members; the convenient situation of the town might be another reason; and the fact that the meeting was to be called upon to revise the rules of the Association, coupled with which there was the proposal to exclude the commercial element, may have been a third. Perhaps the most powerful of all is the one which I state last—viz., that the Association is now under new management. The voices which used to predominate in the councils of the Association are silent. Members who formerly hesitated to come forward in the presence of their seniors have now no dividing wall to get over if they wish to take a prominent part in the business; and, indeed, the thoughtful among them must feel that it is incumbent upon them to be energetic in the interests of the Association if it is to prosper. The advent of new power was apparent, if there were no other indications, by the putting forward for consideration of an entirely new set of rules and regulations. A task so great would scarcely have been undertaken by a body of men well settled down. It required a Committee new to office—men full of zeal and solicitude for the future—to apply themselves to such hard work. The Committee faced the situation; and they have carried a set of rules which are certainly complete, and appear to be capable of covering almost every situation that might conceivably arise. For the compilation of these rules, credit must be given to the President, to the Secretary (Mr. L. Hislop), and, I understand, to Mr. G. Keillor, of Broughty Ferry, one of the Vice-Presidents. The anticipation that the commercial element was to be excluded from the Association has been realized to this extent, that henceforth gentlemen in trade will not be eligible for election as extraordinary members, unless they are principals or managers of trading concerns. The commercial traveller is no longer to be eligible for election. It is left to the Council to determine who are principals of a firm. If they give a liberal interpretation, the new rule will make very little difference to the membership. If, for instance, a gentleman acting as a commercial traveller should also happen to have an interest in the business, he may be held to be a principal. In this case there might be a number of principals in a business eligible for election. If this were so in cases of private firms, how would the Directors of public companies fall to be dealt with? And how, also, would commission agents? These are questions that may be expected to come before the Council, which seems to be the name by which the Committee will henceforth be known; and if they have any difficulty in making up their mind as to who should be admitted, the Association will keep them right. The work of revising the rules was expected to occupy a considerable time. As a matter of fact, owing to the tact of the President—a quality which he displayed all through the proceedings—it was soon over; and the meeting had ample time to consider the technical subjects that came before them. These were three in number, and related to carburetted water gas, high-pressure gas supply, and retort-settings. The papers outshone the discussions, owing, most probably, to the fact that they were informative and not controversial. The work done was of a useful nature, and when account is taken of it, and of the more than usually successful social functions connected with the meeting, members will, on retrospection, have every reason to feel gratification at what transpired at the annual meeting of 1909. Thanks to the excellent arrangements made by the Secretary, the proceedings, from first to last, went without a hitch. The Association have re-elected Mr. Hislop to the office; and, judging by the success which has attended all departments of the work since he assumed office, the members are wise in having continued their confidence in him.

At a special meeting of the Coatbridge Town Council on Thursday, the Clerk reported that the Select Committee of the House of Lords had agreed to the confirmation of the Provisional Order of the Coatbridge Gas Company, in which authority is given to reduce the illuminating power of the gas, though the Town Council had asked for certain modifications. A letter was read from Mr. Lewis Coward, K.C., and Mr. Reginald Neville, pointing out that the Corporation might very well be of opinion that, having made their protest and failed, it did not follow that a Committee of the House of Commons would uphold the decision of the Committee of the other House; and their advice was that, in any event, a petition should be deposited against the Confirmation Bill in the House of Commons, so as to keep the matter open for further consideration. The Town Council, by a majority, adopted the advice, and resolved to lodge a petition against the Bill.

Following upon the adoption of the annual accounts of the Edinburgh and Leith Gas Commission, mentioned in last week's "Notes," there has been issued the customary appendix to the accounts prepared by Mr. John S. Gibb, the Treasurer. The chief figures in the accounts were given in the "JOURNAL" for June 29 last (pp. 984, 990), and this document necessarily repeats a great deal of what has been already published; but it puts in succinct and official form a mass of information regarding the accounts which must be helpful to the individual Commissioners who wish to make themselves better acquainted with

the details of the business than they can be from the information supplied to them from month to month.

The annual general meeting of the Bo'ness Gas Company, Limited, was held last Monday. The Chairman (Mr. L. H. Ballantine), in moving the adoption of the accounts, referred to the very satisfactory results of the year's working. The increase in the quantity of gas made was 1,368,000 cubic feet; and the profit, after allowing £584 for depreciation, amounted to £795. The usual dividend of 5 per cent. was declared; and the Manager (Mr. James Campbell) was granted an honorarium and an increase of salary.

Reverting to the working of the Kelty Gas Company, Limited, for the past year, the balance-sheet disclosed profit at credit of net revenue account to the amount of £1307. The shareholders, at their meeting on Wednesday of last week, approved of the recommendation of the Directors to pay a dividend of 7½ per cent., and to abolish the charges for meter-rents. After remarking on the satisfactory nature of the balance-sheet, and the sound state of the working generally, the Chairman announced that, the arrears of cumulative dividend being now wiped off, the sliding-scale of charges would come into operation, whereby payment of each ¼ per cent. of dividend over 5 per cent. to the shareholders would be accompanied by a decrease in price of 1d. per 1000 cubic feet from the standard prices of 4s. 2d. per 1000 cubic feet to ordinary, and 4s. 4½d. to prepayment consumers; and as the Company were in a position to increase their output without additions to the manufacturing plant, the prospect before them was very hopeful and encouraging.

Meter-Testing at Coventry.—At Coventry, the Gas-Meter Testing Department is carried on in conjunction with the Weights and Measures Department. In a report just issued, it is stated that the number of meters tested during the past year was 2499, of which 14 were wet, and 2485 dry. The fees for testing and stamping realized £75. The expenditure amounted to £23, which shows a balance of £52 of income over outgoings.

Public Lighting of Westminster.—A few months ago, the Town Clerk of Westminster was instructed to negotiate with the Gaslight and Coke Company for all their contracts for public street lighting in the city to terminate at one time. The dates of expiration were as follows: Low-pressure incandescent lamps, St. James's, Strand district, &c., Lady Day, 1910; St. Martin and St. Margaret and St. John, Dec. 31, 1909; high-pressure incandescent lamps, Aldwych, Kingsway, Parliament Street, Whitehall, Wellington Street and Strand by the Law Courts (refuge lamps), Parliament Street, Whitehall, Wellington Street and Strand by the Law Courts (supplemental), Nov. 2, 1910; Parliament Square, Aug. 26, 1910; Parliament Street and Whitehall (Scott-Snell lamps), Dec. 31, 1909. Having regard to the dates of termination, it appeared to the Works Committee that the most convenient arrangement would be for the low-pressure contracts to terminate on March 31, 1910, and the high-pressure contracts on Dec. 31 of the same year; and the Company have agreed to this.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 30.

Sulphate of Ammonia.

Demand has been fairly well maintained; but there has been nothing special about it, and the month's requirements have been covered without occasioning any advance in prices. Direct orders have, in fact, been rather scarce; buyers abroad being fairly well covered by purchases made in advance, and being in no hurry to supplement their purchases. The closing prices are £11 1s. 3d. per ton f.o.b. Hull, £11 3s. 9d. per ton f.o.b. Liverpool, and £11 5s. per ton f.o.b. Leith. For delivery ahead the situation is unchanged; offers from abroad for delivery over the ensuing six months being scarcely 2s. 6d. per ton above spot values, and makers altogether refusing to entertain them. The spring months are neglected, owing to the firm attitude of makers.

Nitrate of Soda.

This article remains unchanged at 9s. 9d. per cwt. for 95 per cent. quality, and 10s. per cwt. for refined, less 2½ per cent. on spot.

LONDON, *July* 30.

Tar Products.

With reference to the prices quoted for tar in the "JOURNAL," owing to the severe competition existing between certain well-known firms in some districts, as also to the demand for the roads, figures are paid which are out of all proportion to the parity value of the article for distilling purposes. It would not, however, be just to quote these as the value of the article. Last week the top price was recorded at 20s. 6d.; this should have been 19s. 6d. There is very little fresh to report in the markets this week. Pitch is decidedly firm, and creosote remains steady. There is certainly a little more inquiry for the former article for both prompt and forward delivery. There has been a little inquiry for 90 per cent. benzol; but it is not having any effect on the market. Crude carbolic is weak, and Continental consumers advise having purchased 60's quality at 10¾d. f.o.b. English ports.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d., Pitch, London, 28s. 6d. to 29s. 6d.; east coast, 28s. 6d. to 29s.; west coast, 28s. to 29s. f.a.s. Mersey ports, 27s. 6d. to 28s. f.o.b. other ports. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 6d. to 6¼d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6¾d. to 7d. Toluol, casks included, London, 8¼d. to 8½d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3⅛d.; solvent naphtha, casks included, London, 10¾d. to 11d.; North, 9¾d. to 10d.; heavy naphtha, casks included, London, 10½d. to 10¾d.; North, 9½d. to 9¾d. Creosote, in bulk, London, 2¾d. to 2 13/16d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2⅞d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 10¾d. to 11d.; west coast, 10½d. to 10¾d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s.,

packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is certainly very quiet, and Beckton prompt is quoted at £11 7s. 6d. Ordinary makes upon Beckton terms are £11 to £11 2s. 6d., and Hull is £11 to £11 2s. 6d.; while in Liverpool the prices are from £11 2s. 6d. to £11 3s. 9d., and in Leith £11 5s. to £11 6s. 3d.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade has been irregular; the Scotch difficulty being the main factor. Local unrest has, however, also been known, and has limited the output at many collieries in the north-east and affected the prices in some degree. In the steam coal trade, best Northumbrians are generally quoted at from about 12s. 9d. to 13s. 6d. per ton f.o.b., though there have been sales at 6d. per ton below the lowest of these figures. Second-class steams are about 11s. per ton f.o.b., and steam smalls are firm and rather scarce at from about 5s. 3d. to 6s. 3d. There has also been some movement in gas coals. The demand is full, more especially for best qualities; the price having risen through the enlarged requirements for export. Durham gas coals are quoted from about 10s. to 11s. 6d. per ton f.o.b., according to quality; while for "Wear specials," perhaps 3d. to 6d. per ton more is quoted. All these prices are, however, subject to the variations that are forced by the uncertainty lately prevailing in the coal trade. Gas coke is quiet, at about 12s. 9d. to 13s. per ton f.o b. in the Tyne.

Scotch Coal Trade.

Trade in coal has been much disturbed, on account of the protracted negotiations between the coalmasters and the miners' leaders, which have now closed. Shipping is greatly upset, chiefly on account of the scarcity of tonnage at Scotch ports. There is a very large demand for coal for home consumption. The prices quoted are: Ell 10s. per ton f.o.b. Glasgow, splint 10s. 6d. to 11s., and steam 10s. to 10s. 6d. The shipments for the week (being holiday week) were small, amounting to 183,603 tons, which was less than in the previous week by 160,732 tons, but greater than in the corresponding week by 14,898 tons. For the year to date, the total shipments have been 7,856,032 tons—an increase of 172,047 tons upon the corresponding period.

The revenue of the Rand Water Board for the year ended March 31 last was £177,156; and after paying interest on the stock and all expenses, there was a balance of £3871. As, however, £8000 has been placed to machinery and plant renewal fund, there is a debit balance of £1987, after including £2142 brought forward.

Schultz, Comins, and Co.—Dissolution of Partnership.

It has been announced that the firm of Messrs. Schultz, Comins, and Co., Chartered Accountants, of No. 50, Cannon Street, E.C., dissolved partnership, by effluxion of time, on the 31st ult. The practice was originally founded in 1887 by Mr. W. A. Schultz, F.C.A., who had served his time with the late Mr. William Liddall, the Secretary of the old Brighton Gas Company, until its amalgamation with the present Brighton and Hove Gas Company. He was joined in 1890 by Mr. Charles Comins, F.C.A., and they together carried on the practice of Chartered Accountants until 1902, when they took in two of their staff, Messrs. W. Wesson and A. H. S. Emerson, as junior partners. Mr. Schultz was also the Secretary of the Whitchurch and District (Hants) Gas Company, and the Soham and District Gas Company; and, on the retirement of Mr. Liddall, he was appointed Secretary of the Ascot District Gas Company, which office he still holds. This Company applied to Parliament in 1906 for electrical powers; and the Bill having been granted, the Company enjoys the reputation of being the first Gas Company to exercise electricity powers. The venture has so far been a great success; and Mr. Schultz has been largely responsible for its successful accomplishment. In 1904, Mr. Schultz and Mr. Comins bought the interests of the shareholders in the Brixham Gas Company (then in a decadent condition), obtained an Act of Parliament, and have entirely remodelled the works; and this is now a highly prosperous concern. They dealt in like manner with the works at Crediton (Devonshire), Hungerford, Saxmundham, and Annfield Plain (Durham). All of these Companies are increasing and successful undertakings. Both Mr. W. A. Schultz, F.C.A., J.P., and Mr. Charles Comins, F.C.A., continue to practise separately at No. 50, Cannon Street—the former as W. A. Schultz and Co. and the latter as Charles Comins and Co. Mr. Schultz retains the secretaryship of the Ascot District Gas and Electricity Company, and the control of the Brixham Gas Company, the Crediton Gas Company, the Hungerford Gas Company, the Whitchurch and District (Hants) Gas Company, and the Soham Gas Company; while Mr. Comins will control the Annfield Plain and District Gas Company and the Saxmundham Gas Company. Both retain their seats, as formerly, on the Boards of these Companies. The arrangement is, we are informed, of a purely friendly character; and their respective interests in the Companies are in no way disturbed.

Profit Sharing in the New Haven (Conn.) Gas Company.—We learn from the "American Gaslight Journal" that stock certificates were distributed on the 10th ult. by the New Haven (Conn.) Gas Company to the employees who have taken advantage of the working of the profit-sharing plan started in April, 1907. The total number of shares thus issued totalled to 551, divided among 197 of the employees. The writer of the paragraph in the American paper says: "Some of his Eastern contemporaries were inclined to smile at Mr. Nettleton when he advocated this plan as far back as 1903; but the laugh now is altogether with him in the result."

Bermondsey Explosion.—It has been reported by the Electricity Committee of the Bermondsey Borough Council that their expenditure consequent upon the deplorable Grange Road explosion recently amounts to £176. From this, it is seen that (though no allegation was made that the electricity system had part in the explosion) it was involved to the extent of sustaining damage.

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, on Monday last week, Messrs. A. & W. Richards sold, by order of the Directors, £8000 of consolidated ordinary stock of the Epsom and Ewell Gas Company. It ranked for a standard dividend of 5 per cent., subject to the sliding-scale, equally with the Company's existing similar stock, the interim dividend on which for the first half of the current year has been declared at the rate of £5 17s. 6d. per cent. per annum. The new issue was all sold at from £115 to £115 10s. per £100. At the offices of the Newcastle and Gateshead Water Company, last Tuesday, 448 lots, of £100 each, of the Company's 5 per cent. preference stock of 1902 were sold by auction by Mr. Charles A. Joel at an average price of £137 12s. 2½d. per £100. The total sum realized was £61,649; the premiums amounting in the aggregate to £16,489.

Proposed Improvement of the Plymouth Water-Works.—The question of the duplication of the main from the storage reservoir at Burrator to the service reservoir at Roborough has been again under the consideration of the Water Committee of the Plymouth Corporation. A Sub-Committee to whom the matter had been referred reported that the 25-inch main conveying the water between the places named was becoming corroded, and that in consequence of this its delivery capacity was reduced to 6¾ million gallons per day. In dry, hot weather the demand rose to over 7 million gallons; and to meet the deficiency either the pipe was put under full reservoir pressure without screening the water, or the leat was used. Neither method was so satisfactory as passing the water through the screening chamber. Various ways of improving and extending the means of conveying water were submitted by the Water Engineer (Mr. F. Howarth). The present main could be scraped at a cost of £700, or a second screening chamber constructed at a higher level, so as to increase the pressure, at an expenditure of £1653. The cost of laying a second main would be as follows: With a cast-iron pipe 25 inches in diameter, £29,246; with a 27-inch pipe, £33,840; with a 28-inch pipe, £35,827; with a 25-inch steel pipe, £29,705; with a 27-inch pipe, £32,538; with a 30-inch pipe, £35,626. The cost of a reinforced concrete pipe would be £27,584, £30,020, £32,110, and £35,178 respectively for the above-named sizes. As an alternative, the old leat might be repaired or reconstructed. The cost of repairing it would be £3000; but if it were reconstructed in a permanent manner, it would be from £35,000 to £40,600. The Committee came to the conclusion that it was inadvisable to undertake large capital expenditure at present, but that any extension of the existing means of conveying water between the two reservoirs should be on the lines of rendering the leat permanently serviceable. In the meantime, the Water Engineer is to submit an estimate of the cost of fixing hatch-boxes and scraping the existing main, for inclusion in next year's estimates.

Reduction in Price by the South Suburban Gas Company.—The Directors of the South Suburban Gas Company have announced a reduction in the price of gas from 2s. 6d. to 2s. 5d. per 1000 cubic feet, to take effect after the Midsummer quarter's account.

Melbourne Metropolitan Gas Company.—Messrs. John Terry and Co., the London agents for this Company, have been informed by cable that the profits for the half year ended the 30th of June last were £84,830. A dividend of 5s. per share has been declared for this period; a sum of £40,000 has been added to the reserve fund; and a balance of £4900 is carried forward.

Crowthorne Public Lighting.—The Crowthorne Parish Council have entered into an agreement with the Yorktown and Blackwater Gas Company to light the district from the 1st of October next to March 31, 1910. The lamps are to be fitted with incandescent burners, and erected at a cost of £3 10s. each; while the maintenance for the period stated is to be £1 8s. per lamp.

Reduced Charge for Public Lighting at Lewisham.—The Highways Committee of the Lewisham Borough Council have received a letter from the Secretary of the South Metropolitan Gas Company stating that, as the result of experiments made with a new inverted burner specially designed for street lighting, the Company are able to make a substantial reduction in the yearly charge. This has hitherto been at the same rate as for the No. 4 burner—viz., £3 4s. 5d.; but by the reduced cost of upkeep and the lower charge for gas, they will now reduce the figure to £2 19s. 6d. As the inverted gas-burner gives a light of 120 candles, compared with 80 candles for the No. 4 burner, the reduction in the cost of lighting by its use will be very considerable, especially as the conversion only costs 3s. a lamp. The Secretary further stated that by reason of the lower price for gas, which came into operation at Midsummer, the charges for the No. 2, No. 3, and No. 4 burner lamps will be reduced to £2 8s. 3d., £2 15s. 6d., and £3 2s. 10d. respectively. The alterations will reduce by £109 18s. 6d. per annum the charge by the Company for public lighting in Lewisham.

Charge for Public Lighting in Hanley.—A revised scale of charges has been made by the British Gaslight Company for public lighting in Hanley. At the meeting of the Hanley Town Council last Tuesday, a letter from the Company was read, stating that the charges would be as follows: Lamps having 5 cubic feet flat-flame burners, £2 8s. 4d. per annum; lamps having triple 5 cubic feet flat-flame burners, £6 18s. 10d. per annum; lamps having single incandescent burners, £2 8s. 4d. per annum; lamps having single incandescent burners, extinguished at 11 p.m., £1 17s. 8d. per annum; lamps having double incandescent burners, all night, £4 3s. 8d. per annum; lamps having double incandescent burners, extinguished at 11 p.m., £2 17s. 10d. per annum; lamps having double incandescent burners, one burner all night, and one till 11 p.m., £3 12s. 10d. per annum; and lamps having triple incandescent burners, one burner all night, and two till 11 p.m., £4 13s. 2d. per annum. The reduced charges include cost of lighting, extinguishing, cleaning, painting, and all repairs, and, in the case of incandescent burners, the maintenance of the mantles. The reductions take effect from the 1st inst.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 300.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl 6	10	Alliance & Dublin 10 p.c.	17¾—18¼	..	5 9 7
298,955	10	,	7	Do. 7 p.c.	12½—13	..	5 7 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd.. . . .	5⅝—5⅞	..	5 10 8
40,000	5		6½	Do. New, £4 paid .	4⅜—4⅝	..	5 12 5
50,000	10	Feb. 25	14	Bournemouth Gas and Water 10 p.c. . .	28¾—29¼	..	4 15 9
51,810	10	,,	7	B 7 p.c. .	16¾—17¼	..	4 1 2
53,200	10	,,	6	Pref. 6 p.c.	15⅝—15⅞	..	3 15 7
380,000	Stk.	,,	12½	Brentford Consolidated	254—257	..	4 17 3
300,000	,,	,,	9½	Do. New . . .	195—197	..	4 16 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	122—124	..	4 0 8
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	100—102	..	3 18 5
220,000	Stk.	Mar. 12	10¾	Brighton & Hove Orig.	212—214	..	5 0 6
246,320	,,	,,	7¾	Do. A Ord. Stk. .	154—156	..	4 19 4
460,000	20	Apl. 16	10	British	43—43½	..	4 11 11
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c. . .	119—121	..	4 19 2
165,700	,,	,,	4½	Do. B 3½ p.c. . .	89—91	..	4 18 11
82,278	,,	,,	5½	Do. C 5 p.c. . .	108—110	..	5 0 0
50,000	,,	June 25	3½	Do. 3½ p.c. Deb. .	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13½—14	..	5 0 0
250,000	Stk.	June 25	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord. . .	109—111	..	4 10 1
1,493,280	Stk.	Mar. 12	5 2/10	Commercial 4 p.c. Stk. .	108—110	..	4 14 6
560,000	,,	,,	5	Do. 3½ p.c. do. .	104—106	..	4 14 4
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	96—98	..	5 2 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
492,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord. .	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd. . . .	24¼—24¾	..	4 17 0
354,060	10	,	12	Do. £7 10s. paid.	18¼—18¾	..	4 16 0
15,161,545	Stk.	Feb. 11	4⅔†	Gas light and Coke 4 p.c. Ord. . .	104¼—105¼	.	4 8 8
2,600,000	,,	,,	3½	3½ p.c. max. . .	88—90	..	3 17 9
3,799,735	,,	'	4	4 p.c. Con. Pref.	105—107	..	3 14 9
4,193,975	,,	June 11	3	3 p.c. Con. Deb.	85½—86½	..	3 9 4
258,740	Stk.	Mar. 12	4¾	Hastings & St. L. 3½ p.c.	93—95	..	5 0 0
82,500	,,	,,	6¼	Do. do. 5 p.c	118—120	..	5 4 2
70,000	10	Apl 29	11	Hongkong & China, Ltd.	17½—18	..	6 2 3
123,500	Stk.	Mar. 12	6½	Ilford A and C . . .	141—143	..	4 10 11
65,780	,,	,,	5	Do. B	106—108	..	4 12 7
63,000	,,	June 25	4	Do. 4 p.c. Deb. . .	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental .	179—181	..	4 8 5
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c. .	120—122	..	4 18 4
561,000	Stk.	Feb. 25	10	Liverpool United A .	226—228	..	4 7 9
718,100	,,	,,	7	Do. B . .	168—170	..	4 2 4
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean.	4⅞—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met. of Melbourne 5 p.c. Deb.	100—102	..	4 18 1
250,000	100	,,	4½	4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	May 27	3½	Monte Video, Ltd. . .	12½—13	..	5 7 8
1,775,892	Stk.	Feb. 25	4½	Newc'tle & G'tesh'd Con.	107½—108½	..	4 2 11
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	91—93	..	3 15 3
15,000	10	Feb. 25	0	North Middlesex 10 p.c.	19½—20	..	5 0 0
55,940	10	,,	7	Do. 7 p.c.	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	137—139	..	5 15 1
60,000	5	Mar. 31	8	Ottoman, Ltd. . . .	6⅛—6⅜	..	6 5 6
31,800	53	Feb. 25	13	Portsea Island A. . .	140—142	..	4 16 11
60,000	50	,,	13	Do. B. . .	132—134	..	4 17 0
100,000	50	,,	12	Do. C. . .	123—125	..	4 16 0
114,800	50	,,	10	Do. D and E.	103—105	..	4 15 3
398,490	5	May 13	7	Primitiva Ord. . . .	6⅞—7⅛	..	4 18 3
796,980	5	July 29	5	Do. 5 p.c. Pref. .	5¼—5½*	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb. .	94—96	.	4 3 4
1,000,000	10	Apl. 29	8	River Plate Ord. . .	15¾—16¼	−¼	4 18 6
312,650	Stk	June 25	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	14—14½	..	5 10 4
62,500	10	,,	6	Do. 6 p.c. Pref. .	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49½—50½	..	4 19 0
135,000	Stk	Mar. 12	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	233—235	..	4 5 1
523,500	,,	,	10	Do. C	233—235	..	4 5 1
70,000	10	June 11	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	122—124	..	4 6 0
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	84½—85½	..	3 10 2
209,820	Stk.	Mar. 12	8	South Shields Con. Stk.	153—155	..	5 3 3
605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120—122	..	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref. .	122—124	..	4 0 8
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord. . .	110—112	..	4 9 3
120,000	Stk.	Feb. 25	6¾	Tottenham and Edmonton A 5 p.c. .	132—134	..	5 0 9
423,940	,,	,,	5¼	B 3½ p.c. .	111—113	..	4 12 11
149,470	,,	June 25	4	4 p.c. Deb.	99—101	..	3 19 3
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	111—113	..	4 8 6
255,6[illegible]6	Stk.	Feb. 25	6½	Wandsworth B 3½ p.c. . .	139—141	..	4 12 2
79,416	,,	June 25	3	3 p.c. Deb. Stk.	73—75	..	4 0 0
835,872	,,	Feb. 25	5¼	West Ham 5 p.c. Ord. .	123—125	..	4 4 0
210,000	,,	,,	5	Do. 5 p.c. Pref. . .	126—128	..	3 18 2
253,300	,,	June 25	4	Do. 4 p.c. Deb. Stk..	105—107	..	3 14 9

Prices marked * are "Ex div." † Next dividend will be at this rate.

When last week the gas was turned on at the new Pavilion Theatre at Market Drayton, it could not be lit. It was then discovered that the workmen had connected the gas-pipes with the water-mains.

Mr. R. Toller, a member of the Birmingham Corporation, and at one time a prominent official of the Gas Workers' Union, has been expelled for consenting to act for a short time as Secretary of a society, to be called the Birmingham and District Municipal Employees' Association, which has been formed by the enginemen's branch of the Union. This act is regarded as an attempt to injure the organization. Mr. Toller was one of the founders of the Union; having started it with some of his fellow-workmen while employed at the Saltley Gas-Works. He took an active part in bringing about the eight-hour shift, abolishing Sunday labour, and securing time-and-a-half for all Sunday work under the Corporation.

The Australian Coking and Bye-Products Company, Limited, has been formed with a capital of £200,000, in £1 shares (100,000 preference) to carry on the business of manufacturers of, and dealers in, coke, coal tar, pitch, and other bye-products of coal.

A curious point has arisen at Leyton in regard to the supply of electricity to motors for producing high-pressure gas. The matter was brought up at the meeting of the Urban District Council last Tuesday on a report from the Electrical Engineer asking for instructions as to the charge to be made where a motor is used solely for the purpose named. Such a motor, be stated, was evidently not employed at the times which the power rate was intended to cover, but coincidentally with electricity for lighting purposes only. It was resolved that in future electricity supplied to motors to be used under these circumstances is to be charged on the scale applicable to lighting.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

CHIEF DISTRIBUTING ENGINEER. Oriental Gas Company. Applications to London Office by Aug. 17.
MANAGER AND SECRETARY. Shepton Mallet Gas-Works. Applications by Aug. 7.
ASSISTANT OUTDOOR SUPERINTENDENT. No. 5121.

Situation Wanted.

GAS COMPANY'S OFFICE WORK OR SHOW ROOM, &c. No. 5118.
ENGINEER WITH EXPERIENCE IN RETORT ERECTION. No. 5119.
SECRETARY, MANAGER, OR ACCOUNTANT. No. 5115.

Plant, &c. (Second-Hand), for Sale.

BOILERS, ENGINE, AND WASHER. Dorchester Gas Works.
PURIFIER, EXHAUSTER AND STEAM ENGINE, GASHOLDERS, &c. Kirkintilloch Gas Department.

Plant, &c. (Second-Hand), Wanted.

GASHOLDER, BALANCE WEIGHTS, AND GUIDE PULLEYS. No. 5120.

Meetings.

BRENTFORD GAS COMPANY. St. Ermin's Hotel, Aug. 6, 2.30 o'clock.
BROMLEY AND CRAYS GAS COMPANY. Offices, Aug. 12, Six o'clock.
CHICHESTER GAS COMPANY. Offices, Aug. 23. One o'clock.
ENFIELD GAS COMPANY. Offices, Aug. 26, 5.30 o'clock.
HORNSEY GAS COMPANY. Offices, Aug. 20, 3.30 o'clock.
IRISH ASSOCIATION OF GAS MANAGERS. Dolphin Hotel, Dublin, Aug. 10.
SOUTHGATE GAS COMPANY. London Office, Aug. 19, 3.45 o'clock.

TENDERS FOR

Coal and Cannel.

BRADFORD GAS DEPARTMENT. Tenders by Aug. 26.

Lamps and Incandescent Burners.

CALCUTTA CORPORATION. Tenders to Messrs. Mansfield and Sons, Liverpool.

Meters.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 11.

Pipes, &c.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 11.

Sulphuric Acid.

DEWSBURY GAS DEPARTMENT. Tenders by Aug. 11.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

IRISH ASSOCIATION of GAS MANAGERS.

THE

ANNUAL MEETING

Of the Association

WILL BE HELD IN THE

DOLPHIN HOTEL, ESSEX STREET, DUBLIN,

ON TUESDAY, AUG. 10, 1909.

The Chair to be taken at 11.30 a.m. by the President.
Mr. F. T. EUSTACE, Tullamore.

Business: Report of Committee; Admission of New Members; Election of Office Bearers; President's Address; Reading of Papers, &c.

PAPERS TO BE READ.

1. "Experience with a Small Sulphate Plant," by Mr. G. Saville, Drogheda.
2. "Some Notes and Queries on the Control of Small Gas Undertakings," by Mr. J. E. Enright, Tralee.

LECTURE.

"Inverted Incandescent Lights," by Mr. Henry O'Connor, Assoc.M.Inst.C.E., F.R.S.E., of Edinburgh.

By invitation of the President, Light Refreshment will be partaken of about 2 o'clock.
For the following day, an Excursion has been arranged; the party taking train to Bray, whence a drive will be taken through Rocky Valley, Powerscourt, Enniskerry, and Dargle.

Geo. Airth,
Pro Hon. Secretary.

Dundalk, July 24, 1909.

CHIEF DISTRIBUTING ENGINEER.

THE Directors of the Oriental Gas Company are about to appoint a CHIEF DISTRIBUTING ENGINEER, to have the Entire Charge of the Company's Mains, Services, and all Matters connected with the Distribution of the Gas in Calcutta and Howrah.
He must have had mature Practical Experience of all his Duties, and have a Thorough Knowledge of Mainlaying, and be competent to Design a Scheme for the Supply of considerable areas.
He will be required to Enter into an Agreement with the Company for a Term of Years, and to proceed to India at an Early date.
Age not to exceed 40 Years.
Salary, £600 to £800, according to Qualifications.
All Particulars obtainable from the Secretary of the Company, Finsbury House, Blomfield Street, E.C.
Applications for the Appointment must be sent to the Secretary not later than the 17th of August.

WANTED—A Manager and Secretary for Gas-Works with an Annual Make of 13 Millions. Must be thoroughly Conversant with all Branches of the Work and Accounts.
Applications, stating Age, Experience, and Salary required, together with References, to be sent to the Chairman, Gas-Works, Shepton Mallet, Somerset, before Aug. 7, 1909.

ASSISTANT OUTDOOR SUPERINTENDENT.

WANTED, a Young Man, well up in General Gas-Fitting, able to ADVISE on all Matters connected with Uses of Gas, prepare Estimates, and make himself generally useful.
Apply by letter, stating Age, previous Experience, and Salary required, to No. 5121, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, 6 to 7 Tons of Gasholder BALANCE WEIGHTS; also suitable GUIDE-PULLEYS.
Price and Particulars to No. 5120, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE—Two Cornish Boilers, 10 ft. 9 in. by 4 ft. 9 in., including some Mountings, in good Condition. Insured for 60 lbs. working pressure. One Vertical TABLE ENGINE, 4-H.P. by Cockey and Sons; also a Cockey's HORIZONTAL WASHER, for 250,000 feet per diem. Being removed for extensions.
Frank Osmond, Gas-Works, Dorchester.

BURGH OF KIRKINTILLOCH.
(Gas Department.)

THE above Council have for Disposal the following SECOND-HAND PLANT; and are prepared to receive Offers for same.
One PURIFIER, water-lute type, 20 feet by 10 feet, with Three Valves and Connections.
One Laidlaw EXHAUSTER and STEAM-ENGINE combined on one Bed-Plate, with Valves, Bye-Pass Compensator, and Steam Governor; maximum capacity, 10,000 cubic feet per hour.
One small Single-Lift GASHOLDER; capacity, 12,500 cubic feet.
One Double-Lift GASHOLDER; capacity, 95 000 cubic feet.
Further Information may be had from the undersigned.

James Bell,
Engineer and Manager.

Gas-Works, Kirkintilloch.

CITY OF BRADFORD.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the Supply of Best GAS COAL, COBBLES, NUTS, and CANNEL, all to be well Screened, Dressed, and free from Shale and Pyrites, to be delivered at the several works of the Corporation during the Period of One Year, commencing on the 1st day of October next.
Form of Tender, with any further Information required, may be had on Application to Mr. Chas. Wood, Gas Engineer, Town Hall.
Sealed Tenders, endorsed "Tender for Coal," to be sent to me on or before Thursday, the 26th of August next.
The Contracts will be let subject to the Fair Contracts Clauses of the Corporation, which may be seen at the Town Clerk's Office, and which the accepted Contractors will be required to sign.
The lowest or any Tender will not necessarily be accepted.

Frederick Stevens,
Town Clerk.

Town Hall, Bradford,
July 28, 1909.

BOROUGH OF DEWSBURY.

THE Gas Committee of the above Corporation invite TENDERS for the Supply and Delivery, during the period ending the 31st day of July, 1910, of:—

(1) SULPHURIC ACID.
(2) WET and DRY METERS.
(3) CAST-IRON GAS AND WATER PIPES.

Specifications and Forms of Tender may be obtained on Application to the Gas Manager (Mr. Geo. Wm. Fligg), Gas-Works, Savile Town, Dewsbury.

Tenders, under sealed cover, endorsed "Sulphuric Acid," "Meters," or "Cast-Iron Pipes," as the case may be, to be sent to me not later than the 11th day of August.

The Corporation do not bind themselves to accept the lowest or any Tender.

H. Ellis,
Town Clerk.

Town Hall, Dewsbury.

CORPORATION OF CALCUTTA.

PUBLIC LIGHTING.

THE Corporation of Calcutta are prepared to receive TENDERS for the Supply of:—
3001 COPPER STREET LANTERNS, and
9000 INCANDESCENT BURNERS for Street Lanterns,
to be supplied about the end of the year 1910.

The Street Lanterns must be designed for a Tropical Climate, and be, as far as possible, Wind, Dust, and Insect proof.

The Incandescent Burners may be either inverted or Upright and of various sizes giving a light of from 25 to 90 Candle Power. They should be Insect proof.

Inquiries in first instance must be addressed to Mansfield and Sons, Limited, Gas Engineers, Derby Square, James Street, Liverpool, who will forward Selected Designs to Calcutta for the Approval of the Corporation.

The lowest or any other Tender will not necessarily be accepted.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. Richards, at 18, Finsbury Circus, E.C.

BRENTFORD GAS COMPANY.

NOTICE is Hereby Given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors will be held at the St. Ermin's Hotel, Caxton Street, Westminster, on Friday, the 6th of August next, at Half-past Two o'clock, to transact the usual Business, including the declaration of a Dividend for the Half Year ending the 30th of June last.

By order,
William Mann,
Secretary.

Office, Brentford,
July 20, 1909.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, No. 63, Chancery Lane, in the County of London, on Friday, the 20th day of August, 1909, at Half-past Three o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th of June last; to declare Dividends; and to transact the Business of an Ordinary General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 6th to the 20th of August, 1909, both days inclusive.

By order of the Board,
William E. Roberts,
Secretary.

Offices: 63, Chancery Lane,
London, W.C., Aug. 3, 1909.

ENFIELD GAS COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, Sydney Road, Enfield, on Thursday, the 26th day of August prox., at Five-Thirty o'clock in the Afternoon precisely, to receive the report of the Directors and the accounts of the Company for the half year ended the 30th of June last; to declare a Dividend; and to Transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 13th to the 26th of August, both inclusive.

By order,
Chas. W. Offord,
Secretary and General Manager.

Enfield, July 28, 1909.

CITY OF CHICHESTER GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors of the above Company will be held at the Offices of the Company, at the Gas-Works, Chichester, on Monday, the 23rd day of August, 1909, at One o'clock in the Afternoon precisely, to receive the report of the Directors and the accounts for the half year ended the 30th of June, 1909; to declare a Dividend; and to Transact the General Business of the Company.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 9th to the 23rd inst. inclusive.

By order of the Board,
Victor V. Vick,
Secretary.

Offices: Gas-Works, Chichester,
July 27, 1909.

BROMLEY AND CRAYS GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held on Thursday, the 12th day of August, 1909, at Six o'clock p.m. precisely, and on this occasion at the Company's Offices, 156, High Street, Bromley, Kent, to receive the Report of the Directors; the Balance-Sheet certified by the Auditors; to declare a Dividend; and to Transact generally the Business of a General Meeting.

The TRANSFER BOOKS WILL BE CLOSED from the 29th of July to the 12th of August, 1909, both days inclusive.

By order of the Board,
Henry W. Amos,
Secretary.

Offices: 156, High Street,
Bromley, Kent, July 27, 1909.

SOUTHGATE AND DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Thursday, the 19th day of August inst., at 3.45 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the half year ended the 30th of June, 1909; to declare Dividends; to elect an Auditor; and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 6th to the 19th of August, both days inclusive.

By order,
Ernest L. Burton,
Secretary.

Secretary's Office, 5, Great Winchester Street,
Old Broad Street, London, E.C.,
Aug. 3, 1909.

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THE JOURNAL OF GAS LIGHTING WATER SUPPLY & SANITARY IMPROVEMENT

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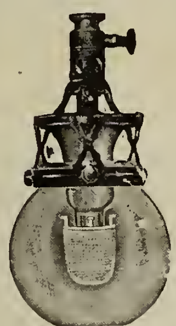

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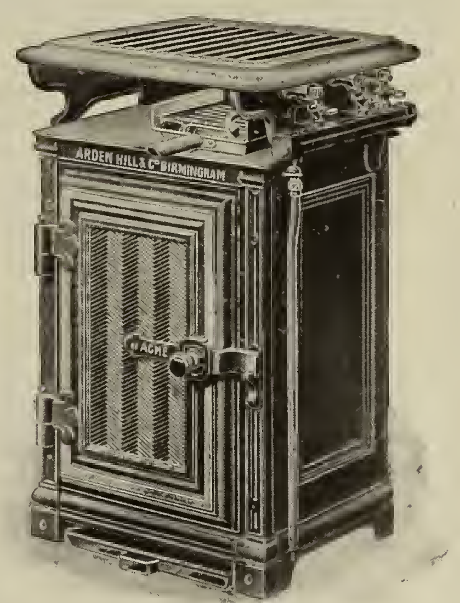

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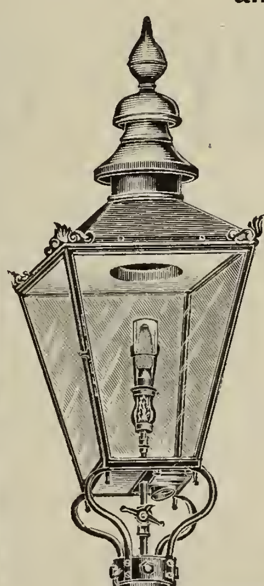

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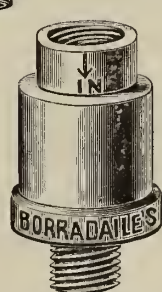

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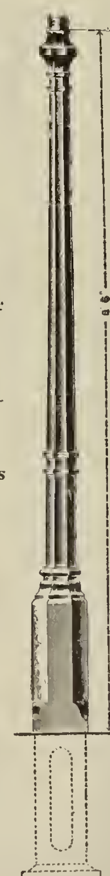

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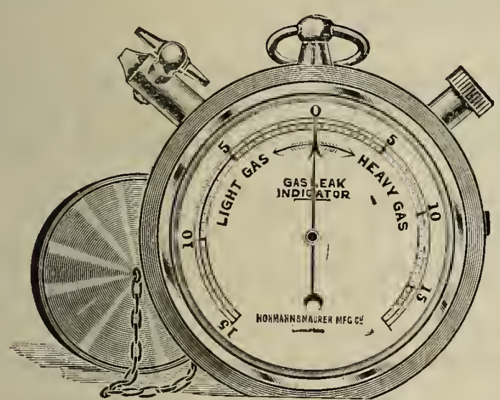

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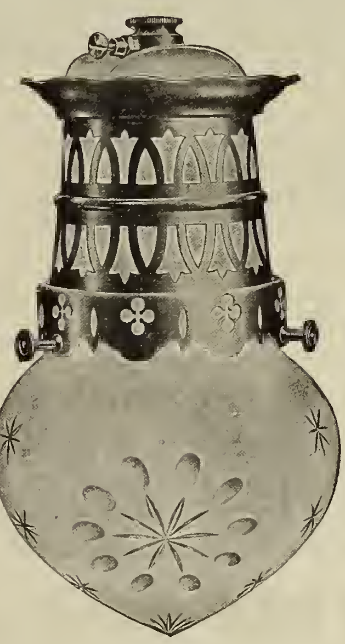

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

No Turning Back.

It is in the future that the greatest interest rests in connection with the Gaslight and Coke Company; and this the most superficial reader of the report of the proceedings at the meeting of the proprietors last week will see. But in looking to the future, the immediate past must not be forgotten; for it is through the recent strenuous work and the bold strokes of gas statescraft that the regeneration of this huge concern has been witnessed, and the still further reformation that lies before has been rendered possible. What is to be, what will be, could never have been brought about without the drastic schemes for regeneration that have been unfolded (and of which, we go so far as to say, there will be more yet) during the past three-and-a-half years—the period of the Governorship of Mr. Corbet Woodall. Everything has been changed; that which was labelled impossible has been shown to be possible; the victims of fallacies have been convicted of the errors of their thoughts and contentions; and the proof is in the benefits that have been scattered around. The consumers are enjoying gas at a lower price than ever before; and there is more concession forthcoming. The proprietors are in receipt of a dividend on a scale that they long since abandoned all hope of receiving; their ordinary stock stands five points or so above par, instead of several points below; the workers are participating in the prosperity of the undertaking; and the financial stability of the Company is greater than at any time within memory. And what is of no less importance, the Company, through these changes, stand in higher estimation than in the past with the authorities and the public, and in the Money Market. The greatest asset of a concern of such magnitude is its credit; and the credit of the Gaslight and Coke Company is in high place to-day. These things are now mentioned, and the acknowledgment made, because the time has come to largely concentrate attention on the future.

The great concern is in a period of transition. It would never have reached this period under the indolent conservative administration of the past, when appreciation of needs was beyond the comprehension of those in supreme control, which supreme control they exercised with cast-iron rule. If ever a gas undertaking showed the necessity of specialist direction, the Gaslight and Coke Company is that one. However, the transition that directs thoughts to the future comprises the placing of Metropolitan gas conditions on a uniform basis. From the beginning of next year, there will be a uniform 14-candle illuminating power standard in the Metropolis; and the whole of the gas workers of London, including the men coming within the extension of the Gaslight and Coke Company's operations, will be working under the system of co-partnership, into the enjoyment of which the larger Company's staff have already entered. The gas consumers in the Company's area and the public authorities will receive a concession in the prices charged for gas, representing the round sum of £100,000 a year. A simultaneous introduction of considerable moment is the calorific standard for the gas supplied by the Company; but heading these changes is the annexation of the important area of the West Ham Gas Company, which will give the Gaslight Company just the outlet they require for prosecuting a vigorous campaign for an increase of business, by which existing spare works and plant may soon be brought into profitable occupation. The state of transition, having regard to the extensive character of the operations of the Company, is such a one as no other Gas Company have been involved in. But there is no peril in it all; on the contrary, it means a reinforcement of security. The lower illuminating power gas, the lower price, the development of business on the eastern side of the district, and the still latent economies in manufacture, distribution, and management (spread over the whole business) are all safeguards of genuine worth and prospective tangible effect. But upon the potentialities of the situation in these various directions, it is impossible at present—though realizing their importance—to place any limit, or estimate of value. But it is possible to see in all these changes, which hinge so much one upon the other, an accumulation of benefit to consumers, proprietors, and co-partners.

If humanly preventible, there is to be no turning back. This is one of the canons of the Company's administration to-day. Said the Governor at the meeting, with the emphasis that betokens resoluteness: "If our policy is to be successful, it should be consistent. Reductions once made must be maintained. There must be no turning back to higher prices, except under circumstances which are plainly irresistible. At the same time, having regard to the moderation of our standard price and to the new condition under which each lowering of price brings not only gain to the consumers but additional income to the employees, it is reasonable that the shareholders should receive the full dividend to which they are entitled." In this announcement are compressed the guiding laws of the future, the continued forward policy, and the principle of equality, within statutorily defined limits, for all who contribute whether by capital, custom, or work to the well-being of the undertaking. With any and every condition that may confront the Board and their executive officers, there is to be no compromise, if it can possibly be averted, that will mean a retracing of steps. In this happy resolve, the proprietors are fully with the Directors; and the confidence they have in them in the present passing to new conditions has never been, under other less momentous circumstances, more heartily and sincerely expressed than at the meeting on Friday.

It is true that in the Bill of this session delineating and sanctioning the new conditions—a Bill that has passed through its parliamentary stages, and now only awaits the Royal Assent—the Board have undertaken bold obligations. They were necessary. That they are onerous has been fully recognized; but they have all been rationally and exactingly calculated. And the Directors would have gone somewhat further, had this been necessary to have carried through their plans. Among their obligations is a reduction in price to both private and public consumers which will, as already stated, represent a concession of about £100,000 a year; while accompanying this withdrawal of revenue, there may be some further loss on residuals. But, in the new coal and oil contracts alone, there is within sight a saving considerably in excess of any likely recession in income from gas reduction and lower market values for residuals. The decreased cost of the raw material is therefore an economy in hand; and prospective economies are looked for in the reduction of the illuminating power, in the development of the volume of business through the increased sale of gas in the extended area and through the reduction of price, and generally in manufacture, from all of which may safely—of course, recognizing that there are limitations to the field of observation—be anticipated a larger margin of profit. There is full contentment with the prospects. Even the calorific power test —which was a condition surrendered in the removal of the hostility to the Bill in Parliament of powerful authorities, who by their subsequent quiescence virtually became allies—is not a disturbing element in the position. The Governor's own words on this matter are noteworthy: "So large a portion of the gas we supply is now used for purposes where heat only is required, that the call for a calorific test is reasonable. The standard of the test is such that we have little fear that under it we shall be called upon for penalties." But this must be read in conjunction with the Governor's former protest against a dual penalty test.

The position and conditions of the Company as from Jan. 1 next are such that they cannot fail to captivate interest. For the results as they develop, there will be a curious watching throughout the gas industry. The best thing we can hope for the Company is that nothing will intervene to restrain freedom in working to the highest ends under their new circumstances.

Carbonizing Methods, and the Standard of Quality.

There was quite a respectable amount of technical interest in the speech with which, before the proprietors, Mr. Charles Hunt inaugurated on Friday his tenancy of the chair of the South Suburban Gas Company; and in a co-partnership company's meeting, where many present are quite capable of appreciating a general statement of the technical position, such an exercise is not by any means out of place. Mr. Hunt focussed the position of the newer carbonizing practices in retorts set on the old principles, as distinct from the vertical system, and which "newer practices," the half-yearly reports as they come in from all quarters of the country show, are making an immense impression on the manufacturing costs through the augmentation of the make of gas per ton of coal, the lessened quantity of coal required for a given make, and the reduction of carbonizing wages. The newer methods have made a big impression on the South Suburban manufacturing results—financial and working; and the Chairman had excellent illustration in the accounts with which he had to deal. Carbonization has for some time been a strong point at Lower Sydenham, and a strong point with the Engineer (Mr. S. Y. Shoubridge), who had made a reputation for carbonizing practices long before he left Salford. In the past half-year's accounts, it is seen that, compared with the corresponding period of last year, there has been a saving of no less than 4800 tons of coal, notwithstanding an increase in the quantity of gas sold of upwards of 16 million cubic feet, representing an additional 1400 to 1500 tons of coal saved. In other words, quoting the Chairman, there has been an actual increase in the quantity of gas sold per ton of coal carbonized of upwards of 1000 cubic feet. Think of that, and what it means! But those are not the only points over which Mr. Shoubridge, his staff, and men are to be congratulated. If we take the carbonizing wages and compare them with the sale of gas, it is seen that the past half-year's working has in this respect left the three London Companies far behind. The figure works out to 1·32d. per 1000 cubic feet sold, which is more than ½d. less than the Gaslight and Coke and South Metropolitan Companies, and more than ¾d. below the Commercial Company. The position is a proud one for the South Suburban Company; and it sets a point for friendly rivalry.

The Company have shown something else in the working; and this is that, under the conditions of London working, and using heavy charges of longer duration, it is possible to make, as Mr. Hunt describes it, "all-coal" gas of an illuminating power that complies with the standard of 14-candle power tested by the "Metropolitan" No. 2 burner. In view of this, he thinks the time is not far distant when Parliament might be again approached for a substantially lower standard of illuminating power than 14 candles. He has an idea that our legislators regard with benevolent eye a lower standard, inasmuch as one or two Chairmen of Parliamentary Committees have expressed views in this direction. We are not with him on that point. Just as one swallow does not make a summer, so the opinions of one or two legislators do not make law. The time is ripe; but Parliament, unlike Barkis, is at present unwilling. Whenever gas of a lower illuminating power than 14 candles has been mentioned in Bills in the last two or three sessions, the authorities of both Houses have shown a distinct disinclination to drop below the line defined in the model clause; and there has been a swift levelling-up to the 14-candle point. Still, there is no doubt that Mr. Hunt is fully convinced that the views of the Legislature are benevolent in this matter; but while that is so, it is "our own carbonizing methods "that have been somewhat lagging." We do not think Mr. Hunt suggests, though he gave conjunction to the two points, that carbonizing practice has ever entered into the consideration of the standard question by Parliament; their sole idea has been (mistaken though it now is) the consumers' protection in the matter of quality.

But better still than the lowering of the illuminating power standard would be, in Mr. Hunt's view, its abolition; and the substitution of a workable calorific power test. That is so; but we venture to predict that it will not be, in the first instance, through Parliament that the primary steps in the subversion of the illuminating power standard and test, and the setting up of a calorific power test, must be made. It has been through the London County Council that the first step has been taken in the application of a statutory calorific power test; and it is not at all unlikely that it will be through the Council, or rather with the support of the Council, that the next revolutionary step will have to be taken—that is to say, the setting up of a precedent for the abolition of the illuminating power standard. If there is one man who could effectively aid the gas industry to hasten the change from an illuminating power standard to a reasonable calorific power one (with variation according to local conditions), that man is Dr. Frank Clowes, the Chief Chemist to the London County Council. The article that he recently contributed to "The Times" Engineering Supplement shows there is very little difference between him and those gas administrators who think as Mr. Hunt does. In his article, Dr. Clowes says that there is still "a sufficient number of flat-"flame burners in use to make the illuminating power of "the gas, *at least for a time*, of importance;" and he adds that "possibly *at no very distant period*, the illuminating test may "lose even the *restricted* importance it at present possesses." The italicized words are healthy signs of Dr. Clowes' recognition of the position. A "restricted importance," however, should not stand in the way of a reform made possible and practicable by scientific advance; and this a scientist above all men should readily recognize. So long as those who are able to assist in this matter pander to the sluggards who will not alter their antiquated procedure, so long will progress be hindered.

The Show Gas-House.

This is an advertising age; and advertising pays in these competitive times. Some of the most old-fashioned of trading establishments, whose business has appeared in the past to have been founded on a rock, and to have needed none of the sustaining and stimulating methods of the modern trader, have discovered in more recent times, through the gradual sapping of their business, the necessity of applying the very methods that tradition and a conceit of their own security had aforetime led them to treat with contempt. Their mistake has meant loss, some of which cannot be retrieved, though method never so acute or attractive be adopted; and attention has had to be directed to "fresh woods and pastures "new." But in the form of advertisement, it does not do to get stereotyped. One can get old-fashioned, and the form become effete, in advertisement as in other things; and there must be change and novelty. And every change and the novelty must be of a kind not only to attract attention, but to induce patronage; for there are methods of advertisement that succeed in the former, but not in the latter. They fail in the most paying effect.

It is not difficult to apply these observations to the gas business. The need of advertising has not been so widely recognized by some gas administrators as it should be; but there will be an awakening sooner or later. In other cases advertising has been maintained at a high level; and, in those instances, new ideas are always welcome. The show gas-house is a new method of advertising. The show-room is as necessary to the well-being of a gas undertaking as the distributing-mains themselves. It is an essential for the consumers' convenience in making selection of fittings and appliances; but it is not by any means the best place for making effective demonstration. The best demonstration is that which is carried out under actual normal conditions. The interpretation of requirement in this regard has been made in one of their districts by the South Metropolitan Gas Company in the show gas-house, of which a description appears in another part of this issue; and we think what has been done there will commend itself as being worthy of acceptance and emulation by other gas undertakings. The house that the Company have fitted up with gas appliances is an ordinary dwelling-house, situated in an area in which building development is proceeding at a fast rate. It is furnished in every detail as a house of the kind should be for occupation, and fitted as every house may be with gas appliances—demonstrating from hall door throughout to top bedroom, the convenience, comfort, utility, economy, availability, labour-saving, cleanliness, constancy, and safety of the use of gas in the household. The house is furnished in a style that combines prettiness with utility; and the gas lighting and heating fixtures are of a kind that harmonize with the general scheme of decoration of each room, and, in fact, contribute to it. It depends where a show-house is situated as to the appropriateness in character of the furnishing; and, in no instance, should a show-house be furnished in so gorgeous a manner that the slightest impression of lavishness is conveyed to the visitor. That, gas as an economical

agent for lighting and heating must avoid in its demonstrations. On the other hand, mere pretence at furnishing would not be the slightest good. It would only end in disappointment to both visitors and the gas undertaking concerned. The novelty is in the real thing; and in the demonstration being conducted under normal conditions.

In fitting up a show-house, too, the choice of gas-fittings and other appliances must depend largely on the neighbourhood. Whatever the class of neighbourhood, let it always be remembered that the day of the old, plain, angular, eye-distressing fittings has passed, and that something of more ornamental merit for all situations in a house can now be obtained at a cheap rate. Something that pleases gives greater satisfaction; and satisfaction will induce greater care. In the fitting up with gas of the South Metropolitan Gas Company's show-house, as described in other columns, there is a completeness to which we do not think many householders will go. But that is not the point. The show-house is to demonstrate the possibilities of gas; and it is possible for every house to be fitted up with economical, useful, and artistic lighting, heating, and culinary appliances in precisely the way that this house is fitted. In the lighting, the bijou inverted burner has large part; but the upright burner is not neglected. The economy and artistic merits of the bijou inverted burners are demonstrated in all the reception rooms, in the hall, on the landing, and at other points. In respect of design and finish, the fittings themselves have been selected for the special purpose to which there has been application; and artistic silk shades have been utilized to complete the decorative effect. It is in the study of the details that full effect is obtained. The convenience of switch lighting is demonstrated in the hall, dining-room, drawing-room, bedrooms, and on the landing. Throughout the house, the heating is by gas-fires; and in conjunction with them the use of safety-taps is shown. Other little heating conveniences are found in the rooms. The hot water supply is provided by gas—either by the gas-heated boiler introduced into the hot-water circulating system, or else by ventilated geysers in the bath-room. For cooking, for the heating of a clothes copper, for clothes airing, for coffee roasting—for, in short, anything for which heat is required in the household, gas is used in this dwelling-house. It is not only a demonstration of the purposes to which gas can be applied in a dwelling-house, and of the efficiency for the various purposes, but it is a demonstration of how lighting and heating appliances should be fitted. It demonstrates something more; and it is that there is no occasion for the occupants of dwelling-houses being worried by consideration for the coal-cellar, and by the dust and dirt and labour created by solid-fuel fires. All this trouble is removed from the shoulders of the householder by the suppliers of gas. There have been gas engineers who have hoped to see the day when gas-works would be the light and fuel centres of every town. Final results and attainments are always better by having an objective beyond reach than by having one that is easily secured. If all houses were fitted as is this one of the South Metropolitan Gas Company, the aspiration of the gas engineers referred to would, it goes without saying, be *un fait accompli*.

This house is an educational treat; and it has already been, in the number of visitors who have passed through the rooms, a popular advertisement and demonstration. In the conduct of such a house, if popularity is to be assured, methods must be of the right order. The attendant must be courteous, painstaking, and discriminating. He will meet all sorts and conditions of people, as has the attendant among the hundreds who have inspected the South Metropolitan show-house. Every one of these visitors, whatever his station in life, can go away, if the attendant properly appreciates his duties, with knowledge that will be used to advertise, and so be an advantage to, gas. There need be no "touting" for orders from visitors. It is sufficient that they come, that they see, and that they understand. The orders will arrive in due season. If there is touting, it will prevent a large number of would-be visitors from making an inspection.

One point more, a show gas-house can only be an appendage of, though better apart from, the show-room. The house must not be lumbered up with a selection of goods from which consumers may make choice. That is a matter for the show-room; while the show-house is for the demonstration of what can be done with gas, and how it should be done, in a manner that householders can understand and appreciate. There is, however, no reason why the show-house in a large gas-supply district should be a fixture. Removals are conducted expeditiously and cheaply nowadays; and in most districts landlords are glad to let houses for short tenancies. People all over a large district will not go to see a demonstration in a part of the district in which they may not frequently be; so the show gas-house must go to the people, and impress its message and lessons upon them in their own neighbourhoods and amid their own circumstances. We think, where adopted, the show-house will prove a very effective advertisement for gas lighting, heating, cooking, and hot-water supply.

A Good Return from East London.

A REDUCED coal account, good manufacturing results, and an increased consumption of gas have, despite poor market values for coke and breeze, given the proprietors of the Commercial Gas Company an excellent account for the past half year, and one comparing well with that for the corresponding period of last year. The balance on the revenue account (£63,922) is £8948 greater than twelve months since; and though a smaller balance was brought into the past half year than into its relative of 1908, the amount available for dividend is £75,884, or an increase of £4571. Consequently, the same dividends can be paid, with a larger sum forward. Looking into the accounts, it is seen how much this prosperous condition is due to the manufacturing department, for (though in the variations of items from half year to half year rather more has been spent on balance in the other departments) the manufacturing department comes out with a reduction of £13,551—the aggregate expenditure having been £138,769. Coal cost less by £13,127; and, notwithstanding that more gas was made and sold, carbonizing wages were down by £1696. This denotes good working; as do also the facts that, though only 1570 tons more coal were carbonized, but 81,399 gallons less oil were used, the Company sold 36,233,000 cubic feet more gas in the six months—the total figures being 101,614 tons of coal carbonized, 1,198,601 gallons of oil used, and 1,587,975,000 cubic feet of gas sold. There is creditable showing here; and the Chairman (Mr. W. G. Bradshaw) will again have an opportunity of congratulating the Engineer, the staff, and the workmen on what they have accomplished. Their records are rising ones. The total expenditure (£200,891) is less by £10,705 than in the first half of last year. The receipts for gas amounted to £195,480; being an increase of £4541, which indicates an improved condition of affairs in East London, albeit there has not generally been any marked improvement in trade. The Company, however, have again good increases in prepayment and stove connections. The common tale is shown by the residual products receipts. There has in these quarters been a breaking-away by £7992; the total income for residuals having been £44,920. But coke and breeze more than account for the falling off, which means that the other secondary commodities gave rather better returns. The total receipts amounted to £264,813, which is a reduction of £1758. If this is deducted from the amount by which the expenditure is lower, the sum of £8947 is shown by which the transfer of £63,922 to net revenue account is better than it was a year ago. The proprietors will on Thursday regard the accounts in the best of lights.

Heat of Combustion and Illuminating Power of Gas.

The paper read by Mr. Arthur Forshaw at the recent meeting of the Institution of Gas Engineers added another chapter to the literature of a subject which the advent of the Welsbach burner brought into unusual prominence, and which has grown in importance with the development of the incandescent system of gas lighting. This innovation had the effect of minimizing the value of the illuminating constituents of gas, and bringing into greater prominence its calorific power. One of the earliest to investigate the new conditions under which gas was being consumed was M. Sainte-Claire Deville, the distinguished Chief of the Experimental Station of the Paris Gas Company at La Villette. Those of our readers who followed the proceedings at the meetings of the International Commission on Photometry held in Zurich in 1903 and 1907, as recorded in our columns, will be acquainted with the scope and results of his labours. They did not, however, reveal the full extent of his inquiries. This was done in the letter from him which was read by Mr. Shoubridge at the opening of the discussion on Mr. Forshaw's paper.

It then came out that as far back as 1894, when incandescent gas lighting was in its infancy, he undertook the systematic comparison of the heats of combustion of coal gases with the illuminating power in a Welsbach mantle, and found that the quantity of light obtained per 1000 calories used was practically constant for all gases. The notes of the experiments which led to this conclusion were never published, as they were regarded as the private property of the Paris Gas Company. In view, however, of his subsequent investigations, and of the interest aroused in the subject by Mr. Forshaw's paper M. Sainte-Claire Deville has presented to the Council of the Institution one of the few lithographed copies made of the notes of his earlier work, and obtained the necessary permission for their publication. In another part of the "Journal" will be found a translation of the document, but without the appended elaborate tables and diagrams. The original will, however, we understand, be placed in the library of the Institution, so that it will be available for any member who wishes to obtain a fuller knowledge of its contents than he is able to acquire from the translation given elsewhere. It is not a little interesting, in view of recent legislation, to note that the author foreshadowed the production of a poorer and cheaper gas than that which was being supplied at the time his investigations were carried out, and the possibility of municipal authorities imposing upon gas companies a maximum and a minimum standard of calorific power for gas.

An Uninterrupted Success.

The Tottenham and Edmonton Gas Company do not appear to be within sight of any falling away of their remarkably high rates of increase. Last half year an additional sale of 8¼ per cent. was again metered. But there must, of course, come a time (though no one can put his finger on the period when it may be expected) when, as a percentage, the rate of increase must decline, because, as Mr. Corbet Woodall, in his address to the proprietors on Saturday, pointed out, a 5 per cent. increase on the business ten years ago represented about 25 million cubic feet, while to-day a 5 per cent. increase represents no less than 69 millions. There is no branch of the Company's private business that does not show an increase; and what is more, though the inverted incandescent burner is doing its work in reducing lighting accounts, the use of gas for other purposes is enlarging the average consumption per consumer, and particularly in the case of the prepayment consumers, who are now being supplied with cooking-stoves rent free. The result is that, though the price of gas was lower by 1d. per 1000 cubic feet in the past half year than in the corresponding period of last year, the gas revenue was £4500 more. Residuals, too, as things go, have done well; being only £275 below the figures a year ago. But this is due to tar and breeze—especially the former—showing up much better. The dividend —in consequence of the lower price of gas (it is now 2s. 5d.)—has gone up ⅛ per cent.; and the workers with this meeting have completed their first year of co-partnery. In regard to the working of the system all are well satisfied, excepting possibly the one or two men who have been discovered to be unworthy of not only being co-partners, but of working with co-partners. Among the points upon which congratulations are due to the Engineer (Mr. A. E. Broadberry) are that the additional quantity of gas sold has been met by a capital expenditure equal to £300 per million cubic feet sold, and that the whole capital now only represents £440 per million. Carbonizing wages, too, are down to 1·7d. per 1000 cubic feet sold, against 1·85d. twelve months since. The account is an excellent one.

Gas Supply in Scotland.

A few weeks ago there appeared in the "Journal" the annual abstract of accounts of the Edinburgh and Leith Corporations' Gas Commissioners, for the financial year to May 15; and in another column of to-day's issue the report and accounts of the Glasgow Corporation Gas Committee, for the twelve months to May 31, are similarly dealt with. In both cases there has had to be recorded a falling off in the demand for gas; the decrease amounting in Edinburgh to 57 million cubic feet, and in Glasgow to about 285½ million cubic feet. The falling off in Glasgow is not, proportionately, to the make, so much greater than in Edinburgh as the figures would seem to show, owing to the fact that the total output is close upon three-and-a-half times larger in the former city than in the latter. To be exact, the decrease in the case of Glasgow amounts to 4·41 per cent.; and in explanation of it, the Gas Committee refer to the general depression of trade and the more extended use of incandescent burners. No doubt, adverse industrial conditions would make themselves the more keenly felt in Glasgow; but most places have suffered in greater or less degree from bad trade, and so it might well be that the smaller demand in Edinburgh also was brought about to some extent from this cause. The second reason advanced—that of the more general use of incandescent burners—is a factor which all gas undertakings have had, in their turn, to reckon with; and its influence has, of course, made itself felt in Edinburgh as well as in Glasgow. Such falling off as may have been traceable to this source has, however, been everywhere regarded with the most perfect equanimity, as it has been universally recognized that any present temporary setback arising from the more efficient results from gas which are rendered possible by the utilization of it in incandescent instead of flat-flame burners, is far more than counterbalanced by the magnificent future prospects which improved methods of consumption have given to gas undertakings. Therefore the position can be hopefully regarded—just as it has been in the cases of the numerous other concerns all over the kingdom which have had to report some falling off of business during the past financial year. The use of the incandescent burner is a development to be encouraged by every means in the gas manager's power—and it has been, and is being, so encouraged—because with it gas is still both the finest and cheapest method of artificial illumination obtainable. While as for trade depression, this is a matter which we all have to take as it comes. It is extremely probable that there never has been a period when general industrial activity, and the consequent employment of labour, did not vary from time to time; and it is equally probable that there never will be such a period. But to return from the general to the particular, it may be remarked that, owing to an increase in price, the Edinburgh accounts revealed a growth of revenue from the sale of gas to the extent of £2840, though the returns from residual products exhibited the falling off which has been so general a feature in connection with the last issued accounts of gas undertakings.

The Figures from Glasgow.

As already remarked, the decreased output at Glasgow in the financial year to May 31 amounted to 4·41 per cent.; and, of course, this would in any case have had a great effect on the revenue. The decline in the receipts has, however, been much larger than it would otherwise have been, owing to a reduction in the price of gas of 3d. per 1000 cubic feet. The gross revenue amounted to £864,210, as compared with £1,006,152 for the previous year; there having, in addition to the smaller receipts for gas, been a diminished income from residual products. As a matter of fact, considering the smaller demand for gas, the results of the twelve mouths' operations are—and rightly so—considered by the Corporation to be very satisfactory. Owing to the reduction in the price of gas, it was estimated by the department at the beginning of the financial year that the present accounts would show a deficiency of £26,000, which could be looked forward to without alarm, inasmuch as in the previous year there was carried forward a balance of £35,500. The actual result, therefore, which is a deficit of practically £9000, may be regarded as, in the circumstances, somewhat of a pleasant surprise—showing, as it does, that the year's working has turned out very much more favourably than the Committee had anticipated. It should be pointed out that the deficit exhibited in the accounts is £14,000; but the difference between this and the £9000 already referred to as the actual deficit on the year's working is explained by an extra depreciation of £5000 having been written off the mains, meters, &c., in the parishes of Cathcart and Eastwood, which were taken over from the Busby Gas Company during the year—this amount being estimated as the goodwill of the business thus acquired.

Increased Make per Ton—Decrease in Price.

The Committee's report contains one item that must be specially gratifying to the Engineer and Manager (Mr. Alex. Wilson) and his staff, and will also provide good news for the citizens. It is as follows: "The Committee observe with pleasure the much greater quantity of gas made per ton of coal carbonized, which was 10,015 cubic feet, as compared with 9522 cubic feet for the preceding year, an increase of no less than 493 cubic feet per ton."

This, however, is not the only item that will give satisfaction to the public; for the report also contained a recommendation by the Committee that, having regard to the result of the year's operations (there is still a sum of £21,500 to be carried to the credit of next year's profit and loss account), and to the fact that the coal required for the ensuing year has been contracted for on favourable terms, the charge for gas should be further reduced by 1d. per 1000 cubic feet. It is true that, when the report, and consequently the recommendation, came before the Council, a lengthy discussion took place on various points; but in the end it was proved that a very substantial majority of the members favoured the excellent proposal of the Committee to supply gas to the consumers generally on the most favourable terms that they feel they can afford to do. The reduction would be a welcome one at any time; but it is perhaps particularly so just when the demand for gas on the prepayment meter system—and therefore presumably on the part of the poorer class of consumers—is rapidly growing. It may be correct, as one councillor remarked, that "the citizens are not asking for a reduction in price;" but it does not from this by any means necessarily follow that they do not want one.

Passage of Gas in Vertical Retorts.

There has been a no small amount of controversy, some of it based on inconclusive considerations, in regard to the course taken by the gas evolved from the charges in vertical retorts. Those who have been responsible for the technical development of the Dessau system long since, from their studies and reasoning, arrived at the conclusion that the gas takes an inward course, and finds exit by way of the cooler parts of the charge; while those who would break a lance with them contend that the passage of the gas is between the inner retort surface and the face of the incandescent coke forming the outside of the charge. In an article in another column, Dr. Bueb meets those whose contentions, based chiefly on hypotheses, are opposed to the submission as to the ascension of the gas through the cool middle part of the charge. In this matter, Dr. Bueb has most engineers and chemists in this country with him; for the very fact that the gas does not undergo the extreme decomposition that is brought about by contact of coal gas with highly heated surfaces, producing unwelcome impurities and troubles, carries a weight of conviction on the side of his contention that cannot be disposed of by anything of a less material character. If his opponents still consider he is not right, then we await their explanation as to why the same chemical changes are not experienced in the vertical retort as are produced by contact of the gas with the heated surfaces of horizontal retorts and the incandescent top coke of the charge. As a matter of fact, if their views were correct, there should be in the vertical retort an accentuation of all that occurs in the horizontal retort with light charges, in view of the high temperature working with vertical retorts; but contrary and welcome effects are produced. The tests that Dr. Bueb describes in his article are not with gas volumes, charges, and temperatures on a working scale, but merely on a laboratory scale. The tests, however, are sufficient to prove how, by passing gas through comparatively thin layers of incandescent coke, its chemical composition is altered by the decomposition of the heavy hydrocarbons, and the gas is deteriorated. The article is highly interesting and worth study.

Borrowing Prior to Sanction.

Among the sins of municipal electricity departments has been the one of spending on capital account beyond their sanctions; and the Local Government Board are much irritated over the matter. Notwithstanding the repeated rebukes of the central department, local authorities have continued their financial waywardness in this respect; and there seemed no way of compelling them to a course of obedience and right-doing in this regard. But a legal declaration has now been made which should have some effect in keeping these authorities on the straight path. It was briefly alluded to on p. 270 last month, but deserves more prominent notice. The case referred to is one in which the Tottenham District Council are concerned. They have been erecting public buildings, and have spent more money upon them than was sanctioned. A large excess expenditure was incurred; and sanction to part of it—£4910—was refused by the Local Government Board. The result was an overdraft at the Council's bankers. The *denouement* has been an appearance of the Council before Mr. Justice Swinfen Eady, and a pronouncement by him that the Council are not at liberty to pay interest on the money borrowed without the sanction of the Local Government Board, that a sum of £855 so paid is illegal, as is also the overdraft itself. But what is worse for the Council, his Lordship has restrained them from making further interest payments, and from applying the general rates to liquidating the overdraft. If, however, the Council should become possessed of statutory authority to borrow the money, then they are not to be prevented by this judgment from paying the interest. One reason that authorities exceed the sanctions of the central authority is that they do not always know their own minds when starting on a scheme. Another is immature consideration; and a further one is that they hope, by this financial stratagem, to get some longer period for repayment—the extension being between the period of spending the money and the date of borrowing after receiving the sanction of the Local Government Board. These are only samples of the reasons that are advanced. We are glad to see the law on the side of straight dealing in connection with local finance; and an additional cause of pleasure is that Mr. Justice Eady has declined to allow the general rates to be applied to liquidating the overdraft. The next scene will be—unless the Council make an attempt, and successfully, to set aside Mr. Justice Eady's decision—a return to the Local Government Board on bended knee for relief from the perplexing position in which the Council find themselves. Anyway, what has occurred will undoubtedly have a good effect, not only in Tottenham but elsewhere.

For the Institution Council Room.

A very proper appeal is being made to members of the Institution of Gas Engineers. It will be remembered that at the recent meeting of the Institution, a portrait in oils of the late Sir George Livesey was exhibited. It was the work of Mr. Edward March, and had been purchased by the Directors of the South Suburban Gas Company for their Board-Room. The Council of the Institution, at the close of the meeting, had under consideration a suggestion that a replica of this excellent portrait should be obtained as a gift from the whole membership, for placing in the Council Room at the offices. The Council found that the amount required could be raised from subscriptions of about 2s. 6d. each; and therefore they are asking those members to whom the idea commends itself for a subscription not exceeding the small sum named.

South Metropolitan Company's New Chief Engineer.

The current number of the "Co-Partnership Journal" of the South Metropolitan Gas Company contains the following remarks by the Chairman (Mr. Charles Carpenter) on the recent appointment of Mr. Doig Gibb as Chief Engineer of the Company: "The greater proportion by far of the employees of the Company have their occupation on the engineering and not the commercial staff; and it is only natural that they should be most keenly interested in the appointment of its Chief Engineer. The choice of an efficient and suitable one has been a matter which has given considerable anxiety to the Directors and myself. What we should have preferred would have been that one of our own people had possessed all the necessary qualifications, and we were disappointed when we could not discover a person among us in whom age harmonized with ability. We therefore had to turn our thoughts beyond the pale of the Company; and our choice fell finally upon Mr. W. Doig Gibb, who is at present Chief Engineer of the Newcastle and Gateshead Gas Company, and who will take up his new duties at the beginning of October. We believe Mr. Gibb's qualities of heart will be as acceptable to the employees as those of his head, which have commended themselves to the Directors; and that all will find in him a strictly honourable, fair-dealing man, who can be relied upon to lend an attentive and sympathetic ear to those appeals to his judgment which I am happy to say are now so few and far between. To the young men in the service I would say this: There is no position which is not open to them if they will but qualify for it; and I do not mean by this that they must wait for or depend upon others for their qualifications. 'There is a tide in the affairs of men, which taken at the flood leads on to fortune;' but they must be ready when it is 'flood.'"

An interesting feature of the half-yearly meeting of the Newport (Mon.) Gas Company last Wednesday, a report of which appears elsewhere, was the presence of three veterans. The Chairman, Mr. Richard Laybourne, is 84 years of age; Mr. Henry Mullock, one of the Auditors, is 82; and Mr. J. Holehouse, one of the shareholders, is 81.

HEAT OF COMBUSTION AND ILLUMINATING POWER OF GAS.

It will probably be remembered that in the course of the discussion on the paper by Mr. Arthur Forshaw, M.Sc., on "The Illuminating Efficiencies of Carbon Monoxide and Hydrogen Used in Conjunction with Incandescent Mantles," at the recent meeting of the Institution of Gas Engineers, one of the letters bearing upon the subject which were read by Mr. Shoubridge was from M. Sainte-Claire Deville, the Chief of the Experimental Station of the Paris Gas Company at La Villette. In the course of his letter, he stated that as early as 1894 he carried out a series of researches on the combustion temperature of gas as affecting its illuminating power when consumed with an incandescent mantle. The results of these researches, to which the distinguished scientist referred again in his recent communication to the "Illuminating Engineer" (see *ante*, p. 109), have never so far been published, as they have always been regarded as the property of the Company in whose service they were obtained. In view, however, of M. Sainte-Claire Deville's subsequent investigations in 1901 and 1905, the results of which he laid before the International Commission on Photometry,* and of the interest aroused in the subject by Mr. Forshaw's paper, he has presented to the Council of the Institution one of the few lithographed copies made of the notes on his previous work, with the tables and diagrams accompanying them, and has obtained the necessary permission for their publication. As these notes constitute an early chapter of the history of this important question, we are pleased to be in a position to present to our readers the following translation of them.

VARIATIONS IN THE ILLUMINATING POWER OF AN AUER INCANDESCENT MANTLE, REGARDED AS A FUNCTION OF THE HEAT OF COMBUSTION OF THE GAS EMPLOYED.

Preliminary Observations.

Conditions to be Fulfilled in Order to Demonstrate the Effect of the Heat of Combustion on the Luminous Intensity of the Burner.

We have already learnt, as the result of previous investigations, that if a given volume of an average gas is consumed in an Auer burner, the useful effect—*i.e.*, the quantity of light produced by 1000 litres (35·3 cubic feet) of the gas—varies considerably according to the quantity of air admitted at the base of the bunsen burner, and that it is at its maximum with a certain definite proportion of air. We know, further, that if we repeat the experiment with a greater consumption of gas, we shall get a maximum useful effect corresponding, as before, to a certain proportion of air; but that this new maximum and this new proportion of air will be greater than in the preceding case. Their value increases with the output of gas. This is a particular instance of a general law which holds good for all luminous centres. The useful effect increases with the absolute importance of the centre. In the present case, it may be said that the useful effect of a given gas and a given burner increases with the absolute quantity of heat imparted per hour to the tissue of the mantle.

The only gases we have to study here are those produced by the ordinary distillation of coal or cannel; and it is a matter of experience that, with equal weight, they have all nearly the same heating power—viz., about 12,000 calories per kilogramme (say, 21,600 B.Th.U. per pound). Hence, if we wish to study the proper illuminating power of each of these gases when consumed with the Auer burner, we must carry out photometric tests on light-centres of equal absolute importance; and, in order to do this, it will be sufficient to burn per hour a similar weight of each gas. If we burnt the same volume, the difference between the quantities of heat given off by the rich and the poor gases would be too great, and the differences found between the consumption per carcel would be partly caused by the influence —extraneous to the question—of the importance of the light-centre. Moreover, it is evidently necessary that each gas should be placed in conditions which are most suitable to it, from the point of view of the proportion of air introduced at the base of the bunsen burner; and the only way to attain this end is to make use of a burner having an artificial air supply. This enables the operator to have always absolute control over the two outputs of gas, to measure them exactly, and to vary them in different ways, without having to alter the burner in any respect whatever.

Consequently, in principle, the course to be followed in carrying out the tests is this: The density or the heat of combustion of a gas being known, it is necessary to calculate the delivery suitable for consuming in one hour a given weight P of this gas, or for liberating the corresponding quantity of heat C. This having been done, the delivery of gas should be regulated to the figure found; and, proceeding cautiously, the proportion of air giving, under these conditions, the maximum amount of light should be sought. Finally, this maximum should be measured by comparison with the carcel lamp. The quotient obtained by dividing the intensity by the consumption, or inversely, will be the useful specific effect of the gas in the Auer burner.

In practice, it has not been possible to work so strictly, because the determinations of the density, heat of combustion, and luminous intensity of a gas can only be carried out simultaneously. Consequently, the consumption suitable for each case cannot be calculated in time to be useful. Operators have therefore been satisfied with making invariable the pressure at which the gas has been delivered at the inlets in the Auer burner No. 1, which was used for the trials; these orifices being those arranged by the maker with the view of the consumption of gas of average quality. Under these conditions, the consumption of rich and heavy gases remains very much below that of poor and light gases. The constant P or C is not strictly obtained; but as these quantities vary within only relatively narrow limits, the importance of the light-centre may be considered as practically negligible. It may therefore be admitted that the figures obtained in this series of experiments represent fairly well the variations in the consumption of gas, in the function of its calorific power, to produce the light of 1 carcel (that is, 9·6 candles), other things being equal.

Results of the Experiments.

Approximate Proportionality of the Specific Useful Effect to the Heat of Combustion.

Altogether, 42 samples of gas were dealt with. The poorest of them were those obtained at the end of the charge; their heat of combustion ranging from 4500 to 4800 calories per 1000 litres (500 to 533 B.Th.U. per cubic foot), and their illuminating power, with the bengel burner, varying from 150 to 180 litres (or 5·3 to 6·3 cubic feet to produce 9·6 candles). The richest gas was one obtained during the first hour of a charge of cannel coal of good quality. Its heat of combustion reached 9373 calories (1041 B.Th. U. per cubic foot), and its illuminating power, with the bengel burner, 53·66 litres (or 2 cubic feet to produce 9·6 candles). Grouping the averages of the results obtained with gases of fairly equal quality, and then making a curve of the variations of luminous intensity per 1000 litres ($I°/_{\infty}$) in the function of the heat of combustion (C) per cubic metre, we get a line very slightly broken, which practically agrees with one having for its equation—

$$I°/_{\infty} = 0{\cdot}00391\ C + 5 \qquad (1)$$

This line makes only a very slight angle with that which represents the strict proportion of the useful effect of a gas to its heat of combustion, viz.—

$$I°/_{\infty} = 0{\cdot}00971\ C. \qquad (2)$$

It may therefore be concluded, without making a very great error, that the two quantities $I°/_{\infty}$ and C are nearly proportional to each other.

The figures in the following table, calculated according to formula No. 1, show what would be the values of the useful effect in an Auer burner No. 1 of coal or cannel gases having a heating power between 4000 and 9000 calories per cubic metre (445 and 1000 B.Th.U. per cubic foot). Using the simplified formula (No. 2), we obtain the figures in the second table, which differ only very slightly from those given in the first one.

* See "Journal," Vol. LXXXIII., pp. 409, 567, 617; Vol. XCIX., pp. 574, 625, 684, 830; and Vol. C., pp. 22, 173.

No.	Heat of Combustion per Cubic Metre Moist, at 10° C. and 760 mm. (50° Fahr. and 30 in. Bar.).	Useful Effect.		Quantity of Air Admitted at Base of Bunsen Burner, per Litre (0·0353 Cubic Foot) of Gas.
		Quantity of Light per Cubic Metre (1 c.m. = 35·3 c.ft.).	Consumption of Gas per Carcel (1 Carcel = 9·5 Candles).	
	Calories.	Carcels.	Litres.	Litres.
1	4000	40·6	24·6	1·41
2	5000	49·6	20·2	2·40
3	6000	58·5	17·1	3·37
4	7000	67·4	14·8	4·39
5	8000	76·3	13·1	5·28
6	9000	85·2	11·7	6·32

No.	Heat of Combustion per Cubic Metre Moist, at 10° C. and 760 mm.	Useful Effect.	
		Quantity of Light per Cubic Metre.	Consumption of Gas per Carcel.
	Calories.	Carcels.	Litres.
1	4000	39·6	25·2
2	5000	48·6	20·5
3	6000	58·3	17·2
4	7000	68·0	14·7
5	8000	77·7	12·9
6	9000	87·4	11·4

Variations in Useful Effect as Affected by the Heat of Combustion of any Gas Consumed in an Ordinary Auer Burner with Natural Air Supply.

Whatever interest the foregoing results may possess from a theoretical point of view, they can only be obtained by using the burner having an artificial supply of air; and they give no idea of those obtained in practice with burners having only the natural supply of air. In order to solve this problem, it was advisable to ascertain by experiment the variations in the luminous intensity and useful effect, when consumed in a No. 1 Auer burner as usually made, of a number of gases varying considerably in richness. These experiments were carried out at the same time as those already described, and with the same gases. The burner with air supply was so arranged that the simple detachment of the india-rubber tube conveying the air from the special holder was sufficient to convert it at once into an ordinary No. 1 burner. This operation was performed immediately after the principal test. Then the consumption of gas was so regulated as to obtain the maximum useful effect compatible with the natural supply of air under the influence of the drawing action of the jet of gas; in other words, the practice was followed of a consumer seeking to regulate his Auer burner to its utmost efficiency by means of a single tap. This regulation was comparatively easy when using a No. 1 Auer burner, since the maximum useful effect almost coincides in this case with a very apparent maximum absolute intensity. The following are the results:—

Characteristic Properties of the Gas Tested.		Results Obtained with a No. 1 Auer Burner with Free Air Supply.			
Heat of Combustion per Cubic Metre of Moist Gas at 10° C. and 760 mm.	Consumption per Carcel in a Bengel Burner (Moist Gas at 10° C. and 760 mm.).	Pressure of Gas.	Consumption of Gas per Hour.	Absolute Luminous Intensity.	Consumption of Gas per Carcel.
Calories.	Litres.	Millimetres.	Litres.	Carcels.	Litres.
4000	204·8	64 0	110·9	4·508	24·6
5000	134·2	46·0	86·2	3·960	21·8
5500	115·6	39·0	74·8	3·723	20·1
6000	101·1	34·0	65·8	3·522	18·7
6500	89;4	29·5	58·2	3·321	17·5
7000	80·5	26·0	52·0	3·139	16·5
8000	67·3	22·5	46·4	2·847	15·6
9000	57·8	20·5	39·5	2·628	15·0

It will be at once seen how these figures differ from those obtained when consuming each gas in a burner suitable to its richness.

The ordinary Auer burner, constructed for consuming an average gas, gives very satisfactory results with coal gases which are poorer than the regulation gas of Paris. All that would be necessary, however, would be to enlarge very slightly the gas and air orifices to enable it to burn, at the usual pressure and under the best conditions, 110 litres of coal gas of 4000 calories per cubic metre with an absolute luminous intensity of upwards of 4·5 carcels—a duty superior to that furnished, on an average, by the No. 1 burner. It is true that from 24 to 25 litres of this gas would be consumed per carcel, instead of only 18 or 20 litres; but this increase would certainly be compensated for by the reduction in price which would result from the general adoption of a gas of this low quality.

On the other hand, we see that the Auer burner, as constructed to-day [1894], is altogether unsuited to the good utilization of very rich gases. When they are burnt with it, their useful effect does increase a little, but in relatively limited proportions. With regard to absolute intensity, it decreases with the richness of the gas—to such an extent, indeed, that in an establishment lighted with the Auer burner people see less clearly if the gas is enriched, and conversely. We consequently arrive at what appears to be a somewhat paradoxical conclusion—viz.: When the Auer burner as at present made shall come to be generally employed for lighting, municipal authorities will doubtless be led to impose upon gas companies a maximum heat of combustion, in the interest of lighting; but this will not prevent them from also imposing a minimum, in view of the employment of gas for heating and the production of motive power.

The question thereupon arises: Could the Auer burner be easily modified with the view of its consuming very rich gases with the maximum useful effect they are capable of producing, and with an absolute intensity at least equal to that now obtained? *A priori*, this appears doubtful. At all events, it is very certain that, if the general adoption of incandescent lighting renders plausible evolution towards a kind of gas poorer, but also cheaper, than that now supplied, there can be no question of the change in the opposite direction.

In bringing these notes to a close, it must be borne in mind that what has been said refers only to gases resulting exclusively from the distillation of coal or cannel—gases in which the calorific power per kilogramme tends rather to increase when one passes from the richest to the poorest of them.

Conclusions.

1.—Other things being equal, the consumption per carcel in an Auer burner varies almost precisely in inverse ratio to the heat of combustion per cubic metre of the gas burnt—in other words, the quantity of light which may be produced with 100 litres (3·53 cubic feet) of gas is proportionate to the heat of combustion of the cubic metre of gas.

2.—This law is only demonstrated experimentally in the case of gases resulting from the simple distillation of coal or cannel—gases which, in fact, all possess very nearly the same calorific power (about 12,000 calories) per kilogramme.

3.—In order that this may be verified, only light-centres of the same absolute importance should be compared one with the other—that is to say, the hourly consumption of each gas must be so regulated that the weight or the heat given off per hour is very nearly equal for all the gases.

4.—Further, each gas must receive at the base of the bunsen burner the proportion of air which is best suited to it. This proportion is a progressive function of the heat of combustion. If the latter exceeds from 4000 to 8000 calories—*i.e.*, varies from 1 to 2—the proportion of air will increase from 1·41 to 5·28, or from 1 to 3·7.

5.—If, leaving these prescriptions out of account, the different gases are burnt in the same ordinary Auer burner, simply regulated for the consumption of the quantity of gas giving the best useful effect, it is found (*a*) that the absolute intensity diminishes in proportion as the calorific power increases, and that when this exceeds from 4000 to 8000 calories, the absolute intensity falls from 4·5 to 2·8 carcels; (*b*) that the intensity per 100 litres of gas increases, but to a much less extent than under the conditions previously defined.

6.—It results from this that if, in ordinary practice, relatively poor gases give the light of one carcel with a consumption slightly higher than those which are relatively rich, they are, on the other hand, capable of furnishing a slightly greater absolute quantity of light.

7.—All the experiments were made with a No. 1 Auer burner; but the results obtained would probably not have been different with a No. 2. The determinations might, however, have been much less precise, owing to the difficulties this burner presents for regulating the combustion to the conditions of the maximum useful effect in each case studied.

Appended to the notes are details of all the experiments, both with and without artificial air supply. In the case of each gas tested, particulars are furnished in regard to its

illuminating power, according to the method of Dumas and Regnault, and to its specific gravity and volumetric composition. But M. Sainte-Claire Deville states that they are given merely for information, and without comment.

The experiments were made over a period extending from May 18 to July 15, 1894; the gas being produced in a setting of seven retorts charged regularly one after the other with coals from various sources. The distillation period of four hours was divided into eight phases of half-an-hour; and a sample of the gas produced in each phase was taken off and stored. The gases studied were divided into seven groups, according to their heat of combustion, which ranged in the case of coal gas from 4000 to 7500 calories; the two cannel gases having heating values of 8526 and 9373 calories respectively.

The results of the elaborate experiments dealt with in the notes are tabulated under 24 headings. The first five give the heat of combustion per cubic metre of gas and per kilogramme of coal, its regulation illuminating power, as tested by the bengel burner, and its specific gravity. The next eight columns show the volumetric composition of the gas and its content of benzol. Following these are six columns giving the results of the investigations into the specific useful effect of the gas consumed in a No. 1 Auer burner having an artificial air supply. The remaining columns furnish similar particulars in regard to gas consumed in a burner of the same type, but with free air supply.

OBITUARY.

The death occurred on the morning of the 29th ult. of Mr. J. L. Hollis, J.P., ex-Mayor of Windsor, and Chairman of the Windsor Royal Gas Company. Deceased was in his 67th year.

Mr. John P. Scott, the Manager of the Bridge of Allan Gas Company, died very suddenly on Wednesday last. He left home in his usual health to attend a funeral in the town. On arrival at the place, he was seized with illness. Friends drove off with him to the residence of a doctor; but he died on the way. Mr. Scott was a highly respected man in the community. He has left a widow.

We regret to announce the death last Friday, at his residence in Upper Tollington Park, N., of Mr. Joseph Mackay, in his 81st year. Mr. Mackay had since 1858 been closely connected with the gas-meter trade, having originally been with Messrs. Croll, Rait, and Co., afterwards the Gas-Meter Company, Limited. Owing to failing eyesight, however, in 1902 he had to retire; and in consideration of the long and faithful services he had rendered to the Company, the Directors pensioned him off at full salary. Mr. Mackay was a Director of the City of Chichester Gas Company from 1893 to 1901, when he resigned. Mr. Kenneth R. Mackay succeeded to his father's position with the Gas-Meter Company, and still holds the appointment. Another of the sons, Mr. J. Watt Mackay, is Assistant-Engineer of the Shanghai Gas Company.

The "Journal für Gasbeleuchtung" reports the death, on June 30, of Herr Christian Reithmann, sen., of Munich, in his 92nd year. Deceased was the son of a clockmaker in Tirol; and, desiring to have a cheap and ready source of power for driving small mechanical appliances, he designed in 1852 a gas-engine (with electrical ignition) consuming a mixture of hydrogen and air. In 1856, he replaced the hydrogen by coal gas as then supplied to Munich. He subsequently improved this early gas-engine; and in 1873 he made it a four-cycle engine with compression, such as is now widely used for industrial purposes—especially in the propulsion of motor-cars. For his inventions in connection with the development of the gas-engine, he received recognition at the Paris Exhibition of 1887, and on other occasions subsequently.

At their meeting last Wednesday, the Bolton Town Council confirmed the Gas Committee's selection of Mr. W. J. Smith, B.Sc., of Carlisle, as Gas Engineer and Manager, in succession to his father, at a commencing salary of £500, rising by yearly increments of £25 to £600 per annum.

Cooling jacket water which is to be employed again for gas-engine cylinders can be utilized at small cost by a construction described in an article in "Power and the Engineer." It consists of a sheet of corrugated iron placed in such an inclined position that the valleys of the corrugations form troughs which hold a shallow layer of water, so that the water flowing down over the sheet is further cooled by being retained in the corrugations or by mixing with the cooler water in them. The device is set up against a wall out of doors, as near the engine-room as possible, and preferably in a shaded place. Water is supplied at the top through a perforated pipe. The bottom corrugation ends with a downward curve, so that the water will flow off in a sheet, and not tend to creep back on the iron and spatter. An outlet-pipe of concrete or an old drain-pipe at the ground surface catches the discharged water and carries it to a sump.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 406.)

Business on the Stock Exchange last week was quiet, as is only to be expected when we are fairly into August. But for all that, the general tone was quite favourable on the whole, thanks to one or two factors which were made the most of. The six-hour surrender of the coal mine owners was hailed as if it portended a lasting peace; and official despatches full of good things from Spain were warmly welcomed. Perhaps in neither battlefield have we seen the worst. However, in Capel Court the sun shone gaily again. The opening day was one of fair promise. The gilt-edged division was firm, and Consols rose $\frac{1}{8}$. Home Rails recovered; but the closing prices were below the best, and most departments were fairly firm. The tone continued good on Wednesday in the absence of any bad news. Consols rose further; and the rest held their own well. Good buying business on Thursday again supported Consols. Railways were, however, rather weaker; and some of the speculative markets gave way. Business fell very quiet on Friday, but did not suffer from the usual Friday realizing. Consols improved again. Railways were steadier, and there was an upward move in Americans. The good tone lasted through Saturday, though business was most inactive, and the week closed well. In the Money Market, there was an abundant supply at easy rates. Discount held pretty firm until nearly the close, when it was inclined to give way. Business in the Gas Market was quite active, especially in Argentine undertakings, owing to the announcement of terms arranged for amalgamation; River Plate being prominent and advancing freely. The half-year's accounts issued show that home undertakings in general have been doing well. Some have increased their dividend, others could do so had they not attained their authorized rates, and a goodly number announce reductions in price. Business in Gaslight and Coke ordinary was brisk at from 104$\frac{3}{4}$ to 105$\frac{3}{4}$—a rise of $\frac{3}{4}$. In the secured issues, the maximum made 89, the preference 106 and 106$\frac{1}{4}$, and the debenture 85$\frac{3}{4}$. South Metropolitan was very quiet at 123$\frac{1}{2}$ and 122$\frac{1}{2}$—a fall of 1; and the debenture marked 85$\frac{1}{4}$. In Commercials, the 3$\frac{1}{2}$ per cent. was done at 105$\frac{1}{8}$, and the debenture at 82 free. Among the Suburban and Provincial group, Brentford old marked 256$\frac{1}{2}$, British 43$\frac{1}{4}$ and 43$\frac{1}{2}$, Ilford debenture 103$\frac{3}{4}$, and South Suburban from 121 to 121$\frac{7}{8}$. In the Continental companies, Imperial made 179 and 179$\frac{3}{4}$, ditto debenture 96$\frac{1}{8}$, Union from 96$\frac{5}{8}$ free to 97$\frac{3}{4}$, European fully-paid 24$\frac{1}{2}$ and 24$\frac{5}{8}$, and ditto part-paid from 18$\frac{7}{16}$ to 18$\frac{3}{4}$. Among the undertakings of the remoter world, Bombay changed hands at 5$\frac{3}{4}$ to 5$\frac{13}{16}$, ditto part-paid at 4$\frac{7}{16}$, Buenos Ayres at from 13$\frac{3}{4}$ to 13$\frac{15}{16}$, ditto debenture at 95, Melbourne 5 per cent. at from 102$\frac{1}{4}$ to 102$\frac{5}{8}$, Monte Video at from 12$\frac{1}{2}$ to 12$\frac{7}{8}$, Primitiva at from 7$\frac{1}{16}$ to 7$\frac{3}{16}$, ditto preference at from 5$\frac{1}{4}$ to 5$\frac{7}{16}$, River Plate at from 15$\frac{5}{8}$ to 16$\frac{15}{16}$, and ditto debenture at 97 and 97$\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

Necessity of Obscured Metallic Filaments—Barbarous Shop Lighting—Roadway Obstruction—A Gas Company Steps into the Breach—Power and Profits—Depreciation and Income-Tax.

The other week there appeared in the "Journal" a review of a book by Mr. Borlase Matthews, entitled "Electricity for Everybody," which review (though it has not gained the author's approval) stands uncontradicted in any part. In the book, it was noticed that Mr. Matthews referred to metallic filament lamps, and stated that "owing to the extreme brightness of the higher candle-power lamps, complaints are sure to arise to the effect that the eyes of the user are strained." Also that 100-candle power naked filament lamps "at short range may be painful and even dangerous." Reminder of these remarks is given by an editorial article in the "Electrician," on "Physiological Effects in Illumination." Our several contemporaries of the electrical world have not yet come to any settled views on this subject. One week they laugh at the warnings and declarations of scientists on the subject, and clothe the electric incandescent lamp in all the finest of harmless characters. Another week, this levity is changed to gravity. The "Electrician" approaches the subject seriously. The article on "Physiological Effects in Illumination" opens by saying: "Those who have the improvement of illumination at heart, not merely from the artistic point of view, but from that of optical hygienics, will have noticed a very unfortunate, not to say retrograde, movement since the advent of the metallic filament lamp." This introduction shows that our contemporary is in a serious frame of mind. The article proceeds: "A few years ago carbon lamps, although generally used with clear globes, were more often than not surrounded with shades which prevented the filament from coming easily into the field of view. As soon as the economic possibilities of the new lamps were appreciated, these carbon lamps were in many cases replaced by metal filament lamps, the shades being left unchanged. The earlier types of metal lamps were made with more or less obscured bulbs. It is noticeable, however, that lamps with clear globes are now used more frequently; and as these are fitted in the old shades, which were made for very much smaller lamps, the result is that the metal filament is left generally quite un-

obscured. *The effect on a sensitive eye is painful, and in any case must be bad, considering the high intrinsic brightness of the metal filament as compared with the carbon.* It might have been thought that the frosted type of lamp would have been adopted pretty generally; but contractor and consumer alike seem to pay no attention to this point, and we suppose *they will continue this course until optical troubles arise.* This is the more inexcusable because a little loss of efficiency is unimportant; and the general effect of using frosted bulbs with metal lamps is to give the sensation of higher illumination, which, after all, is the condition at which we should aim." But the loss of efficiency would at once alter the basis of comparative calculations. However, there is agreement with our contemporary. Many conversions that have taken place, and have come under observation, from carbon filament lamps to metallic filament ones, in both shop windows and for domestic purposes, have produced something that is not only (to use our contemporary's own expression) "painful," but something that is positively hideous. Persevere in this. It is a useful factor in the competition.

It is also interesting to notice a change of view regarding the use of unscreened high-power lights close to the pavement for the illumination of shop windows. Electrical engineers in their fight for this lighting have been largely responsible for this solecism in illumination. They seem to eschew all intelligent application of lighting to purpose, for the sake of getting the largest electricity consuming appliance installed. Perhaps it is thought that, from the business point of view, greater intelligence is shown in this manner than by the more rational treatment by lower consumption lamps. Our much respected friend, Mr. Borlase Matthews—who, in his book on "Electricity for Everybody," has told us more about the vile, evil, injury inflicting, and strength sapping effects of gas when used in shops, than we have ever found out before after a lifelong study—is of opinion that brilliant lighting should not be left by the shopkeepers to the gin palaces; but there is no general agreement as to the correctness of this advice. A writer in the "Industrial Supplement" of the "Electrician" has a distinct leaning towards modifying the rage of electricians for suspending flame arcs a few feet above the footpath. While he agrees that a "favourite" method of illuminating shop windows is by suspending outside the establishment powerful lights which are shaded (sometimes) on the road side, but which throw an exceedingly bright light on the goods displayed, he says "another, and even better, method is to light the window from inside; ordinary incandescent, or, rather, metallic filament, lamps, being used for the purpose." Even, then, such lights should be shaded on the roadside, as there is nothing more distressing to an inspector of goods placed in a shop window than to have these lamps on a line with, or in close proximity to, his eyes. When they are thus hung, inspection speedily terminates. In this, the writer in the "Electrician Industrial Supplement" is in accord with us. He says: "In spite of the advances that have recently been made in the study of the science of illumination, it is distressing to see how little the knowledge thus acquired has filtered through to the ordinary consumer or been put into practical use by him. Only too often is a shop window lighted in such a way that the lamps glare into the eyes of the prospective customer, and prevent the wares displayed being properly seen. The fact that this method is not infrequently used by the smaller optician is not without a touch of humour. . . . To walk along one of the principal streets in comfort at the present time really requires a pair of blue spectacles, though there should be no need for this if the illumination were carried out in a scientific way." We agree. There is a large amount of missionary work to be done among central station engineers, who do not care to see a diminution in the lighting accounts of their customers.

Not long since our good contemporary the "Electrician" was in a state of great dudgeon over the fact that, at the commencement of the overhead street lighting by high-pressure gas-lamps in Fleet Street, a tower ladder was employed of a somewhat more cumbrous type than was necessary, during the daytime. Public inconvenience and a few other charges of a more paltry character were brought against the offending tower ladder; and, with eyes upturned, our contemporary was thankful that with the centrally suspended electric flame arc lamps in Cannon Street, there was no such daytime inconvenience to either pedestrians or road traffic. The electricians did their trimming, we were told, during the small hours of the morning, when all respectable people—except those who were engaged providing the daily news for the country and the daily provender for London's myriads—were asleep. After these reproaches of the temporary gas methods and the homage paid to the ways of our electrical friends, it was not without surprise that, on passing along Cannon Street on the afternoon of the 30th ult., we found, just at the important point where Cannon and Queen Streets intersect, a tower ladder blocking the road traffic—when cabs and other vehicles were exceedingly busy in the City in view of the approaching holiday—for the purpose of giving attention to a flame arc lamp. How many of the other lamps had called, or would afterwards call, for the use of this impediment to vehicular traffic cannot be said, as more time than was occupied in watching the operations at this one lamp, and the efforts of a policeman to keep the traffic on the move, could not be afforded. If there is inquiry into the truth of this allegation, and into the dimensions of the tower-ladder, and the space of the roadway occupied by the obstruction, we shall hope to see, in the interests of justice and fair play, our contemporary girding those who were responsible for this interference with the traffic at such an important point, and at such an important hour. When the original Fleet Street tower ladder was the subject of anathema on the part of our contemporary, something was said about mediæval times, and about a good many other things. If what was said fitted Fleet Street lighting at one time, the criticism will fit Cannon Street now; so let us have it, with any additions that the honour of electricity demands.

Last week comment was passed on the subject of local electricity supply undertakings feeling keener than ever the competition of private electric supply plants, for considerable installations of lighting. The danger is a present one, and likely to be in its effects a progressive one. It was a bitter pill that the Hastings Corporation had to swallow a few months ago when they found that, so it was said, the capital cost of laying a cable to the St. Leonards pier, to meet the demands of an American Entertainment Syndicate, would be such that a contract could not be entertained that would bring them in any profit. It is notorious that the Corporation have had sad experience of throwing out long and expensive lines, and getting few bites and unprofitable business at the other end. There must be a limit to this sort of thing, if the administrators of electricity undertakings are not desirous of impressing people with the notion that they have run completely mad. The Hastings Corporation were wise—on this occasion; and we are pleased, by way of change, to be able to applaud an action of theirs in connection with their electricity supply undertaking. But there was no need for the American Syndicate to go without electricity if they wanted it. While the Corporation were struggling with the adverse circumstances in which they found themselves, the Gas Company came to the aid of the Syndicate with a private electric generating plant driven by gas-engine. To-day, the pier is lighted by this plant with myriads of electric lamps and gas-lamps at cheaper cost than the Corporation could have done it for; and there is universal satisfaction at the brilliance of what has been accomplished. But a second important point is that the American Syndicate have an insurance in having the gas supply at hand, as well as the electricity supply from the private plant. The demonstration as to cost, and the protection of gas, will not be lost upon other large consumers in the district, who know, by recent painful experiences, that it is not at all a bad thing to have, in the matter of lighting, two strings to one's bow, when the principal lighting medium is electricity.

It is a long lane that has no turning; and it is a tremendous long lane that some of the electricity power companies are now traversing to reach the dividend-paying point. Electricity supply wants peculiarly favourable areas to make a really paying thing of it. Otherwise, it is better for investors to put their money into some other business that will give them a quicker, better, and more certain return. The Newcastle-upon-Tyne Electric Supply Company has been held up as the paragon of a power supply company. It has been quoted in parliamentary committee rooms, and has been taken as a model of all that is righteous in a power company. It has a specially fine district—a district unequalled in opportunities for a power concern. Alas! the Directors have declined to recommend an interim dividend on this occasion on the ordinary shares, though there is a remainder of profit, after satisfying all prior claims, to provide a "small" one. But "the Directors consider that, in view of the critical position of the coal trade, and the great stoppage and damage to other trades which may result therefrom, it would not be prudent to deal with the balance before the end of the financial year." The balance, be it noted, is only sufficient for the payment of a "small" dividend. What a fortunate thing the Directors got out their report before peace was declared in the coal world. They would have had one excuse the less for not paying a dividend had they been but a little later.

The question of allowances for depreciation in assessment for income-tax is one in which gas undertakings have been concerned; and therefore it will not be without interest to refer to what has resulted in this matter from protracted discussion between Somerset House and representative electrical bodies. It has been decided, in respect of cables, that, in addition to repairs, allowance for depreciation may be granted at the rate of 3 per cent. per annum on the written-down value. On all other plant (exclusive of loose tools, meters, and office furniture) depreciation may be allowed at the rate of 5 per cent. per annum on the written-down value, in addition to the cost of repairs. As to conduits, no allowance should be made for depreciation; but annual expenditure on repairs and renewals may be allowed as working expenses as and when incurred. Respecting meters, loose tools, and office furniture, no allowance should be made for depreciation; but annual expenditure on repairs and renewals may be allowed as working expenses as and when incurred. "Written-down value" is defined as meaning original prime cost, *plus* subsequent additions, less all allowances actually granted in respect of wear and tear. The Council of the Incorporated Municipal Electrical Association consider the allowances for depreciation inadequate in assessing for income-tax; and it is held that full regard should be given to the periods allowed by the Local Government Board for repayment of loans in respect of similar assets. What a singular thing! For years we have been listening to municipal authorities arguing that no special depreciation provision is necessary in their electricity undertakings, seeing that the repayment of the loan is quite sufficient as the equivalent of depreciation. If they are right, what they have to grumble at in the allowances granted, is not altogether clear. But there are platitudes that would fit the position—such as circumstances alter cases, and some folks are never satisfied.

NOTES FROM WESTMINSTER.

The Gaslight and Coke Company Bill has had its third reading in the House of Lords; and now only awaits the Royal Assent. Its progress through the Upper House has shown the direct opposite of the pace at which it went through the House of Commons. But this might not have been the case if a member of the labour party had been translated to the Lords—Mr. William Thorne for example. He has said some harsh things about the Lords in his time; but now he sees how inconvenient it is for the Socialists to be unrepresented there.

Glamorgan Water Scheme Rejected. The closing days of last month witnessed the parade of the evidence *pro* and *con* the Glamorgan Water Board scheme before the House of Lords Committee, over which the Earl of Kintore presided. It was all very similar to that heard a few weeks previously when the measure was before a Committee of the Lower House. Briefly, the Bill was promoted by the County Council; but it did not deal with the whole county, though the whole county was booked to supply the financial security. The object of the Bill was to ensure, through a Water Board, the water supply to large areas of the county in the future. Among the proposals was the taking over of five water undertakings and the sources of supply of certain local authorities, and to make necessary extensions of works and fresh provision of water. Mr. Reginald Middleton was the Engineer to the scheme. The county, however, was not unanimous in the matter. There was a good backing; but several local authorities and companies wanted to be excluded from all participation, financial or otherwise. Much evidence was given; but it is altogether complicated, and somewhat uninteresting for those who are not locally concerned. The Committee tried to focus consideration on the two points as to whether the scheme was workable, and whether it was equitable to all interests. Apparently midway in the proceedings they did not think it was, for the Chairman announced that they noticed that the whole Administrative County was to be brought in as collateral security, although quite two-thirds of the county did not agree to the scheme, and friction and expense in the future seemed unavoidable. The Committee felt that the areas of the Rhymney and Aber Valley Gas and Water Company, and of the Borough of Neath, should come out of the Bill; and that the consent of any outside authorities intended to be included thereafter must be obtained as a necessary preliminary to an application for a Provisional Order. This cleared the ground considerably; and the evidence proceeded. But in the end the Committee were unanimously against the measure, though they were far from thinking that Glamorganshire will not some day require a comprehensive scheme for the provision of an increased supply. Through the Chairman, the Committee made courteous reference to the ability that leading Counsel had shown in conducting the complicated case, and in rendering assistance to their Lordships. Such an acknowledgment is not often made in the Committee rooms.

Cardiff Water. The water section of the Cardiff Corporation Bill was opposed in the House of Lords on the point of outside charges; the Committee considering the matter being that sitting under the chairmanship of the Duke of Northumberland. The Llandaff and Dinas Powis Rural District Council were the only opponents. Engineering evidence was given by Mr. C. H. Priestley, the Corporation Water Engineer. According to his explanation, the Corporation want parliamentary sanction to construct a reservoir larger than the two at present existing. The capacity of the new reservoir will be about 725 million gallons; and the estimated cost of the scheme is £272,000, including land. It is calculated that the available storage will then suffice for thirty years. But the opposition was directed entirely against the outside charges. By the Act of 1884, the Corporation are permitted to charge outside any sum not exceeding 25 per cent. more than is charged for water within the borough. The decision of the Committee was that this should be continued until Jan. 1, 1919; afterwards the excess charge to be reduced to 12½ per cent., with a corresponding reduction for water supplied in bulk.

Greenock Water Charges. The question of charges was also raised before the same Committee in connection with the Greenock Corporation Bill; but the proposals in the measure were allowed to pass. One of the principal is in connection with twenty or so charitable institutions, which have been exempt from charge. It is now proposed to levy a rate on them; and while in the Commons the Corporation agreed to give the institutions concerned a rebate of 25 per cent. for five years, and 12½ per cent. for the succeeding five years. The Lords Committee have left this clause as it stood when the Bill passed from the Commons.

Outside Electricity Supply. It transpired when the Watford District Council Bill came before a Committee of the House of Lords the other day, that an agreement had been arrived at with the Gas Company, who were hostile to the Corporation being authorized to supply electricity outside their area. The Bill proposes an extension of the limits of the electricity supply area in order to take in Cassiobury Park, and to furnish electricity outside the area in the event of consumers desiring a supply. The Board of Trade, in a report, referred to the provisions of the Electric Lighting Acts (Amendment) Bill now before Parliament, in which it is provided that authorities desiring to give a supply outside their own district must obtain an Order so to do from the Board of Trade. The Gas Company desired the Council to take this clause from the Board of Trade Bill, adding the limit of 500 yards, which, in the case of Watford, is confined to the area around the town in which the Council desire power to supply. To this the promoters assented.

A MODEL GAS LIGHTED AND HEATED HOME.

A Surprise Visit.

When walking from Catford down the Bromley Road towards a district known as Southend, an erection on a neat grass plot in front of a house that bears all the attractive features of a suburban villa residence, arrested the attention of the writer the other day. This erection is a large framework of tubing, with wrought-iron ornamentation, and glass front and back, forming a large rectangular box. On the front of the case, in prominent lettering, runs the announcement:

ESTATE SHOW-HOUSE.
LIGHTED AND HEATED BY THE
SOUTH METROPOLITAN GAS COMPANY,
FURNISHED BY
CHIESMAN BROTHERS, LEWISHAM.

This is no pigmy looking sign that seems afraid of causing resentment by obtruding itself upon public notice. It has a mission to perform. A conspicuous object by day, it is a still more conspicuous one when illuminated at night time by incandescent gas-burners, controlled by switches in the hall of the house. The announcement is intended to be such that even those who run may read, whether it be day or night; and it succeeds in its purpose. The writer ventured up the pathway to the house. By way of change, it was a warm, and fairly bright day; and the door stood invitingly open, showing a hall furnished in homely fashion. A brand new door mat, with the word "Welcome," in black letters, woven into its khaki body, gave encouragement to enter; and immediately the affable attendant came forward (whom it afterwards appeared was one of the South Metropolitan Company's district officers), and expressed the pleasure he would have in showing his visitor round. He knows his business. That the writer was in a position to judge; and he did not spare himself by slipping over the detail, or in any way showing an inclination to discharge his duty in a perfunctory manner.

One was soon on friendly terms with the attendant; and it was ascertained that the Gas Company have gone into this piece of enterprise in connection with a considerable building development, known as Watt's Estates, upon which road after road is being opened up, and flanked on both sides by new houses. It is a big thing; and the Gas Company have gone into the very midst of this new property, and fitted up the house as a house of the kind may be fitted up for lighting, cooking, and heating—to serve convenience, comfort, and utility, and at the same time to add to the decorative effect of a home, at reasonable expense. The work is well done. The house serves not only the purpose of being of assistance to incoming tenants on the estate, but, being situated in the main road, many passers-by turn in to make an inspection, and the Company are so catholic in their ideas that visitors are welcomed even though they are not resident in the Company's district. It is a case of "throw thy bread upon the waters," &c. Nor are visitors worried for orders for gas-fittings. The fitting-up of the house is intended to supply, under realistic conditions, a demonstration of how the services of lighting, cooking, and heating should be, and can be, performed by gas—economically and effectively. The whole of the light and heat required in the house is supplied by the gas passing through one gas-meter; and a coal-cellar in the place is really a superfluity. It and its accompaniment of dirt and dust (if stocked with coal) is not required in this house; the dust and dirt and all the labour are left for the Gas Company to deal with at the gas-works; and the householder is not required to have any dealings whatever with coal merchants and coal heavers. The Company are the householder's agents and servants in all these matters; and they relieve the householder of all the worry and trouble, by furnishing them, "on tap," with a cheap gaseous "fuel" in every room for incandescent burners and for heating purposes, at a low price.

While making inquiries into these matters, the eye notices, through the open door, that there is a lobby light in an ornamental lantern; and it is fitted with an inverted burner. Our guide round the house starts at this point, and shows how the gas to the lobby lamp is ignited and extinguished from within the hall by the use of a tumbler switch. There is also a hall light, with an upright burner, in an ornamental lantern; and in the angle wall at the rear of the hall, there is an oval-mouthed grate, fitted with gas and ball fuel. In passing, it is noticed that the house is so complete in its equipment that it is "on the telephone" for the convenience of customers. From the hall, introduction is made to the dining-room, which is well, but not extravagantly, furnished; yet very pretty. Over the table there is a four-light pendant, fitted with bijou inverted burners, and self-lighting

mantles. The lamps in their small red shades and beaded fringes look very effective. While mentioning the bijou inverted burners, it is of interest to notice that large use is made in this modern style dwelling of these low-consumption burners. For decorative effect in the modern house, they are not to be beaten; and we must say we like them as well on this account as for their high efficiency. On either side of the chimney breast, there are fixed bracket lights fitted with upright burners and bye-passes, and controlled by a pneumatic push near the door. The room contains a desk; and the desk carries a standard lamp with an incandescent burner and neat shade. In the fire-place is a gas-fire—properly fitted; and not merely stood in front of a discarded coal grate. All the rooms, in fact, are gas heated; and where a special fire is not fixed, the grate is supplied with ball fuel and gas.

From the dining-room, we pass to the drawing-room, which is decorated attractively, even artistically, without being lavish—that is to say, having regard to the class of property. The ladies describe it as charming. The central fitting is a three-light brass pendant, equipped with the well-known "Metrolite" burners, each burner being controlled by a separate switch near the door. Our guide quotes the price of this fitting; and, good looking as it is, and the nearest approach ever seen to an electric light fitting, the price complete is quite moderate. On either side of the chimney breast, there are incandescent gas "candle" brackets in gilt, fitted with lilliputian mantles of the upright kind. Central on the wall of the room opposite the fire-place, is a double-armed "candle" bracket of the same type and design. Coming under observation also is a floor standard lamp, fitted with an upright burner, and large shade; and our guide incidentally mentions that floor standard oil-lamps are now being converted by the Company for gas lighting. The South Metropolitan Company are great at conversion, as witness the 28,300 chandeliers transformed to fixed and safe appliances, free of charge, during the last twelve months. It may be thought that the lighting fixtures are overdone in this drawing-room. Each source of light, however, is of small capacity; and the Company, in the demonstration seek to show how effect, as well as utility, can be obtained in drawing-room lighting by gas. The room is fitted with a gas-fire, with light green enamelled casing, and Adam decoration in gilt. It is a handsome, yet not costly fire, and is fitted with Carpenter's patent tap. There is an upright brass tube at the side of the fire-place; and on the top of the tube the tap, which is supplied with a removable key, so that, when the gas has been turned off, it cannot by mischance (or by children) be turned on again. On the hearth of the fire-place is a movable kettle-stand, enamelled in art colour.

On the way to the domestic offices, it is noticed that the banister pier-post at the foot of the stairs is surmounted by a statuette holding two bijou inverted lights. This is an excellent ornament to the hall. In the passage leading to the scullery and kitchen, in a well-lighted cupboard, the meter is found on a shelf, so as to be available for speedy reading, and turning off by the consumer. Meters are not always favoured with such comfortable and convenient accommodation. A Stott governor is fixed to the outlet-pipe; and this reduces the pressure to $2\frac{1}{2}$ inches. In the scullery, a "Metro" No. 2 cooker is found; this being of a type that can be hired at 2s. a quarter. The stove is fitted with hood and ventilating-pipe. Alongside is a "Scarborough" gas-heated copper, also provided with a ventilating-flue. An upright incandescent burner on swing bracket is fixed between the cooking-stove and copper—of course, at a height to give plenty of headroom for work below. In the kitchen is a combined gas and coal range—"The Queen," which also incorporates a water heating-arrangement. A water gas-heater is also introduced into the hot-water circulating system, so that this can be employed when the kitchener is not in use. Coffee-roaster, gas-heated airer, and so forth are also found in the kitchen. The lighting of the kitchen is by a central pendant, with large opal basin-shaped shade and eye-screen; the maximum amount of light by these means being thrown downwards without inconveniencing the eyes of the worker.

Going upstairs, a tumbler switch is fixed in a convenient place, so that a landing light can be set going before the landing is reached. In the prettily furnished bed-rooms, the fittings are in oxidized silver. The front bed-room has a bijou light over the bed, with small (beaded-fringed) silk shade; and this light is controlled by a tumbler switch handily placed at the side of the bed. On the walls, either side of the windows, there are brackets, also fitted with bijou lights and silk shades; and over the dressing table there is a two-light pendant. The room is fitted with a gas fire and a Carpenter's patent tap (as previously referred to), a separate trivet for a kettle, and a curling-iron stand. The adjoining dressing-room is lighted by an upright burner, and heated by a gas-fire. In the spare bed-room, the lighting is by two brackets (with upright burners) on either side of the dressing-table; and over the latter is a pendant carrying two bijou inverted burners. The gas-fire is fitted in the same manner as the one in the front bed-room.

In the corridor leading to the nursery, lavatory and bath-room accommodation is found. In the latter, Ewart's well-known No. 2 "Lightning" geyser, fitted (as it should be) with ventilating-pipe, is connected over the bath. This will produce hot water at the rate of 3 gallons a minute, or boil water at the rate of 3 quarts a minute. A 5 ft. 6 in. bath can, in the summer, be supplied with hot water by means of this heater in eight minutes, and in winter in eighteen minutes. The temperature of water flowing at these rates per minute is 40° Fahr. above that of the cold supply. Over the lavatory basin is placed one of Ewart's lavatory "Gem" geysers. With it, a small pilot-light is left burning; and when one of the hot-water taps is opened, the gas automatically lights up. The reverse is the case when turning off the hot water—that is to say, when a water-tap is turned off, the supply of gas to the burner is automatically discontinued. This geyser is fitted with a spray, or shower rose, and a tap for the supply of water for washing and shaving purposes. The lighting of the bath-room is by an upright incandescent burner. The walls of the nursery are pictorially papered, a cot stands in one corner of the room, toys are scattered about—even to the inevitable Teddy bear. The lighting of the room is by a single pendant incandescent light with opal dome shade and beaded decoration. The heating is by a gas-fire, controlled by the safety-stand tap already described. A boiling-ring is on top of the gas-fire. A gas-trivet is also fitted with the patent tap, so that young meddlesome fingers cannot interfere with the gas supply.

The novelty of this house (which is furnished well and in excellent taste) at No. 107, Bromley Road, attracts attention. Before leaving, we are asked to sign the visitors' book; and an inquiry as to how the enterprise is being rewarded was answered by a reference to the book, which was commenced on July 26, though the place was opened a few days earlier. An ordinary day's entries variously number from thirty to fifty; but as each signature, as a rule, represents a party, the visitors per day actually number, on an average, about three times more than the signatures. For instance, on Bank Holiday, there were at least 300 signatures; and the number of people who passed through the place on that one day was at least 1000. But with all this large number of people passing through the show house, and having the modern gas fittings and stoves explained to them, there was not the slightest damage done to the furniture or to the fittings. The best advertising for gas in these times is a demonstration with the normal conditions of a household as the setting. We have it in this model home, and congratulate the South Metropolitan Gas Company upon it, and upon the success, as expressed by popularity, of their enterprise.

VICTIMS OF ILLUMINANTS IN GERMANY.

Herr F. Schäfer, of the German Continental Gas Company of Dessau, has published in the "Journal für Gasbeleuchtung" his usual summary of statistics relating to personal injuries caused by accidents due to gas and other illuminants in Germany during the past year. The following tabular statement gives the figures for 1908, with the corresponding figures for 1907 within brackets; the line A being the number of accidents, the line B the number of persons injured, and the line C the number of deaths:—

	Coal Gas.	Electricity.	Petroleum.	Spirit.	Benzoline.	Acetylene.
A .	281 (197)	71 (57)	186 (225)	109 (115)	125 (82)	82 (25)
B .	341 (280)	66 (67)	196 (267)	122 (145)	158 (152)	19 (29)
C .	86 (40)	51 (48)	94 (130)	46 (67)	24 (18)	3 (6)

The total number of accidents attended by injury to the person has therefore increased from 701 to 790 in the course of a year; but the number of persons injured has fallen from 940 to 902. The number of deaths was approximately the same in 1908 as in 1907. Of the accidents due to coal gas, 192 were explosions, causing injury to 206 persons, of whom 5 died; while 89 were caused by gas escaping unconsumed and overcoming 135 persons, of whom 81 could not be resuscitated. The breaking or splitting of rubber tubing was responsible for 26 cases of asphyxiation, 17 of which ended fatally, and 3 explosions. There is only a small increase in the number of accidents reported as due to electricity, which is probably to be ascribed to the incompleteness of the reports made up to the present time. For instance, the report of the Industrial Insurance authorities for 1908 is not yet available; but it recorded for 1907 the deaths of 45 persons through electric current in Prussia alone. The great increase in the number of accidents due to benzoline or petroleum spirit is doubtless to be ascribed to the spread of motor traction. There is a falling off in the number of accidents due to acetylene. In addition to those recorded in the table, there were 8 cases of injury due to air gas, of which one terminated fatally, 2 slight accidents due to oil gas, 4 accidents with 2 deaths due to suction-producer gas, and 4 accidents with one death due to blast-furnace gas. Faulty or badly-managed heating appliances were responsible, through the evolution of carbonic oxide, for 54 accidents, involving 98 victims, of whom 69 could not be resuscitated.

Tar-Painting Macadam Roads.—In his annual report, the Birmingham City Engineer (Mr. H. E. Stilgoe) states that the "very beneficial" operation of tar-coating macadam roads was considerably extended during the summer of 1908. In the summer of 1906, three roads were treated by way of introducing the system; in 1907, the department tar-sprayed an area of 362,746 square yards, at a cost of £1398 8s. 4d., or 0·925d. per square yard; and last summer an area of 578,286 square yards (or a length of $44\frac{1}{4}$ miles) of macadam was covered at a cost of £2113 1s. 3d., or 0·876d. per square yard.

COAL CONVEYING AND STORING PLANT OF A GERMAN GAS-WORKS.

By a Berlin Correspondent.

The No. I. Gas-Works at Leipzig, till a short time ago, were coaled by manual labour. The coal-store, situated parallel to the retort-house, and separated from it by a number of tracks, forms a triangle, with a truncated apex. When Messrs. Unruh and Liebig, of Leipzig-Plagwitz, undertook to erect a mechanical coaling plant, they had to utilize this coal-store (fig. 1), consisting of nine individual sheds, 12 metres in width and 15 to 55 metres in length; arranging it for mechanical loading and discharging. Furthermore, the coal was to be automatically discharged, crushed, and conveyed to the retort-house, and delivered into elevated hoppers ready for the retort-charging machine. The plant was to be capable of dealing with 60 tons per hour.

In order to comply with these conditions, the central section of the coal-store was separated from the remainder, and rendered applicable to mechanical coaling by a suitable increase in height. In the track in front of the store were fitted a weighing-machine and a waggon-tilter (fig. 2), operated by an electric-motor through two intermediary gearings acting on two pumps. This arrangement, on the one hand, ensures rapid tilting, and, on the other, provides for a stand-by—a principle adopted throughout all the plant, so that one-half (30 tons capacity) always forms a reserve to the other half.

The coal tipped from the waggon falls into a funnel-shaped masonry pit, at the bottom of which are two feeders, supplying the coal to two bucket elevators which raise it to the third floor of the coal-station. As large coal, falling through a grating of about 40 centimetres mesh, had to be handled, both the feeders and elevators had to be given ample dimensions. The buckets were therefore made 800 millimetres wide, and 400 millimetres high; and, running on rollers, they constitute a continuous row. The lifted coal is allowed to proceed in two different directions—either into the retort-house or to the stores. In the former case, it is taken from the elevator to two crushing-machines of the "jaw" type, with preliminary sieves, where the small coal is separated, and thence, by two elevators, on to two automatic weighing-machines. After having been accurately weighed there, the coal is taken over two feeders to two enclosed band-conveyors, traversing the space between the coal-store and the retort-house, to the latter. The band-conveyors enter the roof at about the middle of the retort-house (fig. 3).

Fig. 1.—Coal-Store at the Leipzig Gas-Works.

The retort-house contains six elevated storage-hoppers having a total capacity of 360 tons. Over each hopper two conveyor bands run from the middle to both sides. In the centre is situated the distributing station, arranged so that either coal-store conveyor can be used to charge either retort-house conveyor—thus providing an ample reserve. Each of the bands has an automatic travelling dumping-car, going to and fro above the hoppers, and charging them at regular intervals. The hoppers have several rotary slides, allowing coal for the retort-charging machines to be withdrawn.

For the mechanical charging and discharging of the coal-stores, there is an electric overhead railway, surrounding the whole of the plant at a height corresponding to the height of the doors. This is in two sections, both of which traverse, in parallel, the central shed No. 5 (fig. 2), containing the despatching station. There they can be connected together by means of switches. From this outside railway, two rectilinear tracks run through each shed. Each of these tracks can be connected with the outside railway by two shunts; thus obtaining from the central despatching station communication through each shed. In order to load a shed, the shunts having been properly adjusted, the suspended railway-trucks are filled with 1·4 tons of coal from the buckets of the uncrushed coal-elevators, after which they are set in motion.

In each of the sheds are situated, besides the suspended railways, girders on which travels what is called the "buffer-truck." This can be manipulated through chains and a hand-wheel from the entrance to each shed, and comprises a buffer striking the lever which controls the bottom valves of the truck, thus disengaging these valves and dumping the coal while the truck is travelling. The suspended railway truck travels with opened valves as far as the despatching station, where it gets on a dead section, on which it is stopped. The operator then closes the valves, pushes the truck behind the bunker, and, after filling it, sets it travelling again towards the shed, by locking a switch. The sheds can thus be filled without any hand labour, apart from the arranging of the coal, which is poured out in a heap.

While the trucks used for filling the stores are provided only with travelling gear, those used for taking the coal from the stores have both travelling and lifting gear. They are, however, designed for holding only 1 ton of coal (fig. 4). The process is as

Fig. 2.—Waggon Tilter and Coal Elevator.

Fig. 3.—The Band Conveyor in the Retort-House Roof.

follows: The shoot above the crushers is first opened, so that the suspended railway truck, travelling above, may dump its coal (after the locking-lever has been lifted) into the shoot, and so into the crushers; and as this is effected in the course of travelling, no superintendence is required at this point. After a proper adjustment of the shunt, the empty cars proceed to one of the coal-sheds, where the buffer-truck has been stopped at the point where the vessels are to be filled. This buffer-truck comprises a rail which, by throwing the contact roller from the conductor, stops the truck. It is further provided with a traction rope of sufficient length, actuating the controller fitted to the buffer-truck. By operating this controller, the vessel is lowered down to the coal as long as the contact is actuated; this being interrupted at any height desired, in accordance with the height of the storage. When the vessel has been filled, the controller is again operated in the same manner, until the vessel, having reached its highest position, automatically brings into action the travelling motor. The filled truck travels as far as the despatching station, and, on its passing above the shoot, this is opened, and the coal is discharged through it on to the crushers, while the empty truck returns to the charging-shed. There is thus no manual operation required apart from the shovelling.

Fig. 4.—Charging the Suspended Railway-Trucks.

All the machinery is operated electrically, from a small central station arranged in the first section of the coal-store. Furthermore, the adjoining municipal electricity works, when required, would supply their current as a reserve. The following motors are employed: One for operating the tilting pump; two for the crushers and sieves; two for the elevators for large and crushed coal respectively, and the conveyors leading to the retort-house; and two for the four conveyors in the retort-house.

According to the provisional programme of the proceedings in the Engineering Section of the British Association at the Winnipeg meeting, which will open on the 25th inst., the Committee on Gaseous Explosions will present their second report, and Mr. Dugald Clerk, F.R.S., will submit a paper on the work of tne Committee.

RAILWAY RATES AND THE GAS INDUSTRY.

By S. Whettall.

British Railways annually receive over £40,000,000 for carriage on goods carried by merchandize train. This amount excludes minerals and passenger fare receipts. When one considers what an enormous sum is spent on railway carriage, it is surprising to know from experience what little interest is apparently displayed by some traders in things pertaining to railway rates and affairs. Especially is this the case when it is realized that a certain amount of knowledge on the railway rate question will repay the merchant. Business people would be much surprised if they knew what great numbers of overcharges are made every year by the Railway Companies' servants in rendering carriage accounts to the public. Particularly is this so where certain goods are open to an incorrect interpretation of the classification of the articles being taken. Frequently, also, it is the case when machinery (mentioned hereafter) is forwarded, as, owing to the numerous different rates which are in existence for machinery, there are instances where a trader is charged on a much higher scale than is correct.

It must not be inferred that Railway Companies deliberately charge wrong and excessive rates; but the obvious and tangible fact remains that the public are overcharged to some considerable extent by having to pay more for carriage than they are legally bound to do. Two of the principal reasons why the public are made to pay more are: (1) Lack of knowledge of railway rates on their part; and (2) pressure of work preventing the railway clerk from taking sufficient care to avoid making mistakes. The rates and invoices are supposed to be checked by a responsible party. But in many towns this is only done in a very indifferent manner; and if the rate charged appears to be ample, little trouble is apparently taken to rectify many overcharges.

Railway Companies have a singular way of dealing with overcharges which are found out after the money has actually been paid. Supposing that a trader has paid his account, and has not deducted or noticed any overcharge. In the meantime, perhaps, the check clerks belonging to the Railway Company have found out that the trader has been charged too much. In this case, the surplus is retained by the Railway Company, and is registered in what is termed the "Overpaid Book." A moderate estimate of the total amounts which accumulate and are registered in these Overpaid Books, and still remain unclaimed, would be £1000 per week for all the railways in Great Britain.

The sources from which the surplus money emanates are so many and so varied that to quote a few instances will be sufficient for the purpose of this article. Suppose, for instance, a person went into a goods office to consign a quantity of gas-pipes. The clerk charges them under Class 3, rate 40s. per ton, and charges the trader for 10 cwt. at this rate, which amounts to 20s. This sum is paid by the sender probably at the time of consigning the goods. When the goods are being invoiced by the forwarding clerk, he may discover that the rate is in excess of the proper charge, owing to a special rate of 35s. being in operation for these goods. There is thus an overcharge of 2s. 6d. on the transaction; and this amount is registered in the Overpaid Book—the money going into the pockets of the Railway Company. Gas-pipes are generally charged under what is termed the Class C rate, unless a special rate in the Iron and Steel List happens to be in force. Very often there is a special rate in operation for gas-pipes, especially from certain centres of the iron trade; and the special rates are as a rule from 10 to 20 per cent. less than the ordinary class rate, although the reduction varies considerably. In any event, it will always pay the trader to ascertain whether there is a special rate in operation in the area over which he wishes to despatch goods, as a considerable saving is effected by watching this point.

As already remarked, a great many overcharges are made in connection with machinery traffic, owing to the numerous rates this traffic may be classified under. There is a mileage scale for various kinds of machines and engines, which is frequently overlooked; and as this scale provides for cheaper rates in most cases for gas and other horizontal engines, &c., it is advisable that the trader should see that this lower rate is used. Machinery in cases in parts is chargeable in Class 2 according to the Railway Classification Book; but in a great many instances it will be found that the trader has been charged at probably Class 3 rate, which is a higher one.

Frequent mistakes are made in what are termed as smalls—*i.e.*, items 3 cwt. or under, which come under the smalls scale. It may be said that the Railway Companies are empowered by law to charge from 5d. to 1s. 6d. more per package, according to weight, for goods under the smalls scale. When two small packages or more are despatched to the same consignee by the same sender on the same day, the trader should see that the separate weights are lumped together and not charged separately—*i.e.*,

		Cwt.	Qrs.	Lbs.	Ton.		s.	d.
Incorrect way—	1 box of gas-fittings .	0	2	14	at 63s.	..	2	8
	1 ,, ,, ,, .	0	3	0	,, ,,	..	3	0
							5	8
Correct way—	1 box of gas-fittings .	0	2	14	at 63s.			
	1 ,, ,, ,, .	0	3	0	,, ,,			
		1	1	14	at 63s.	..	5	0

Overcharges are often made in this way by the railway, by charging separately.

A list of some of the goods used in the gas trade is appended, with the necessary explanation of the rates and the classes which the good are chargeable under.

	Class.	
Gas lime and other purifying refuse (excluding spent oxide of iron)	A.	
Gas or coal tar in owner's tank-waggons	A.	
,, ,, except otherwise provided for	B.	
Gas carbon (from retorts)	B.	
Gas-pipes, iron or steel	C.	I.
Gasholder sheets	C.	I.
Gas-pipes, iron or steel, in lots less than 2 tons	1.	Y.
Gas-engines, beds and cylinders	1.	
Gas-valves, iron or steel	1.	Y.
Gas-engines (when less, the mileage scale applies)	2.	
Gas-bracket blocks, wooden, packed in cases	2.	
Gas generators and holders, iron or steel, packed	2.	
,, ,, ,, ,, ,, ,, unpacked	3.	
Gas-fittings in parts, except brass and copper tubing	3.	H.
Gas-making apparatus	3.	
Gas-meters (If not packed, only accepted at owner's risk)	3.	
Gas-stove fittings, not accompanying gas-stoves	3.	Y.
Gas or oil stoves (If not properly packed, only accepted at owner's risk)	3.	Y.
Gasaliers or chandeliers (If not properly packed, only accepted at owner's risk)	5.	

I signifies Iron and Steel List; and it often happens there are special rates for traffic in this list. H means Hardware List; and there are numerous special rates in operation for goods in this list. Y signifies that if an "Owner's Risk" note is signed, a reduction of 15 per cent. will be made from the rate.

For classification purposes, railway rates are divided into eight different sections or classes; and, in addition to these classes, are special rates for all classes—such special rates being allowed as a rule for large quantities, or possibly owing to the regularity of the traffic.

The names of the classes are as follows:—

Class A includes coal, slag, slack, gas lime, &c.
,, B ,, rough stone, bricks, gas carbon, &c.
,, C ,, various kinds of timber, gas-pipes, bolts and nuts, &c.
,, 2 ,, coal-cutting machines, petroleum oil, machinery in parts, packed in cases, gas-engines, &c.
,, 1 ,, coal-crushing machines, coal-washing machines, lubricating oils, gas-pipes in less lots than 2 tons.
,, 3 ,, various kinds of hardware, such as harness, weighing-machines, gas-fittings, &c.
,, 4 ,, wood patterns, steam-gauges, electrical instruments, &c.
,, 5 ,, glass carboys, gasaliers, chandeliers, and other fragile articles.

The classes vary in price—Class A lowest, Class 5 highest.

A.	B.	C.	1.	2.	3.	4.	5.
4s.	5s.	7s. 11d.	12s. 6d.	14s. 2d.	17s. 6d.	21s.	24s. 2d.

Maximum Terminals.

In respect of Merchandize Comprised in the undermentioned classes.	Station Terminal at each end. Per Ton. s. d.	Loading. Per Ton. s. d.	Service Unloading. Per Ton. s. d.	Terminals Covering. Per Ton. s. d.	Uncovering. Per Ton. s. d.
A	0 3	—	—	—	—
B	0 6	—	—	—	—
C	1 0	0 3	0 3	0 1	0 1
1	1 6	0 5	0 5	0 1½	0 1½
2	1 6	0 8	0 8	0 2	0 2
3	1 6	1 0	1 0	0 2	0 2
4	1 6	1 4	1 4	0 3	0 3
5	1 6	1 8	1 8	0 4	0 4

Classes 1, 2, 3, 4, and 5 include the charges for conveyance over the railway, use of Railway Companies' waggons and sheets, covering and uncovering, loading and unloading, and cartage at both the receiving and forwarding ends (unless specified to the contrary in the rate-book). Liverpool is one of the exceptional places where cartage is not included in classes 1, 2, 3, 4, and 5. But such exceptions are rare. Class C rates include all the services with the exception of cartage; and this the trader has either to provide himself, or else pay for in addition to the rate. The only services that Class A includes are the charges for conveyance, and for the station terminals—*i.e.*, the use of the station, &c. The trader as a rule provides the waggons for this class of traffic. If not, a charge for waggon-hire is made when the Railway Companies' waggons are used. This charge varies from 4½d. to 1s. 3d. per ton, according to the distance the waggon travels. Class B rate includes the rate for conveyance, the charge for the station terminals, and the hire of waggons. Class C rate includes the station terminals, hire of waggons, charge for conveyance, unloading, loading, covering, and uncovering. Class 1 to 5 rates include station terminals, hire of waggons, charge for conveyance, loading, unloading, covering, uncovering, and also the charge for cartage at both ends, unless otherwise specified in the Railway Companies' rate-book.

In cases where the trader performs any of the services which are stated as being included in the rate, he is entitled to a rebate. The following is a list of the services which he may perform, if he gives proper notice to the Railway Company:—

Providing waggons for traffic in Classes B and C and 1 to 5.
Performing the service of loading and unloading in Classes C and 1 to 5.
Performing or doing without the service of cartage on traffic in Classes 1 to 5.
Using private sheets or doing without sheets for traffic in Classes C and 1 to 5.

In any of these cases, the trader could claim allowances, the maximum scale of which is given below. It must be distinctly understood that with respect to some of the sidings, private and otherwise, special agreements are in force between the traders and the Railway Companies; and in all such instances the terms of the agreement will bind both parties.

Should the trader look after the rebates mentioned in the foregoing matter, he will effect some considerable saving; and, in addition to these rebates, it is policy to see that wherever a special rate is in operation for any class of traffic, this rate is charged, and not the ordinary class rates, as the special rate is generally lower than the ordinary one.

USING STEAM-TURBINES ON GAS-WORKS.

The "Journal für Gasbeleuchtung" of the 31st ult. contained two articles on different applications of the steam-turbine in gas-works. The first, by Herr Pfudel, of Charlottenburg, deals with the use of turbine blowers as gas-exhausters; the second, by Herr Pohmer, the Manager of the Mariendorf Works of the Imperial Continental Gas Association, deals with the use of the turbine blower for long distance high-pressure gas supplies. Both papers were presented at this year's meeting of the Brandenburg Association of Gas, Electricity, and Water Engineers.

Herr Pfudel states that the steam-turbine has already been extensively adopted at the No. 2 Gas-Works at Charlottenburg. For working the extensive coal-conveying plant and the coke-handling plant, there are two turbine dynamos, each of 100 kilowatts, for driving the electric-motors. The blast for the boiler-furnaces in the new boiler-house and the compressor of the water-gas plant are also worked by steam-turbines. There were already established in the No. 2 condenser-house two vertical reciprocating exhausters for pumping the gas, each of a capacity of 175,000 cubic feet per hour, and room was provided for a third. These exhausters, however, take up a great deal of space; and it was feared that when a third was erected there would not be space for proper supervision of, and attendance on, the rest of the apparatus in the room. It was therefore decided to put in, instead of the third reciprocating exhauster, a steam-turbine coupled with a compressor. The compressor is on the Rateau system, and is driven by a Laval steam-turbine erected on the same bed-plate.

The arrangement is shown in fig. 1. The compressor, working at 4000 revolutions, pumps 175,000 cubic feet of gas to a pressure of 31·6 inches of water. The turbine itself is then making 20,000 revolutions. The Rateau compressor is on the fan principle, and works in two stages. The fan wheels are of wrought steel, and the blades of steel plate. The special feature of the compressor, however, consists in three cast-iron rotating pieces, which are divided in the horizontal middle plane so that, by removing the upper portion, access is readily obtained to the shaft and the other moving parts. Owing to variations in the make of gas, the governing at first presented some difficulty. It is accomplished by means of regulating nozzles which are now controlled in somewhat similar fashion to the Hahns governor on rotatory exhausters. Experience has shown that the great number of revolutions of the fans effects a very large separation of tar; so that the work of the tar-separators which follow the exhauster is greatly relieved. The chief advantage of the arrangement is its small initial cost. The whole apparatus costs between £600 and £650, and weighs about 4½ tons. There is, further, considerable economy of space, and the foundations are cheaper, as they are not subject to thrust or shocks. No bye-pass is necessary, as when the turbines are at rest the gas can pass in the ordinary way through the fans.

In regard to steam consumption, the steam-turbine, although intended to be run up to 25 H.P., has hitherto only been run up to 15 H.P. It is provided with a Körting jet apparatus; and experiments have shown that the consumption amounts to 33 lbs. of steam per horse-power-hour. The steam consumption has been measured by a steam-meter from an Elberfeld firm, which depends on the passage of the steam through a pipe and up through a valve-like casing in the conical part of which is a valve plate, the position of which is recorded on a diagram, and is determined by the amount of steam which passes round its edge.

Herr Pohmer said that the high-pressure main from the Mariendorf works to the south-west suburbs of Berlin had an initial pressure of about 40 inches of water. Formerly the gas was forced into the main solely by a Roots blowers driven direct by a steam-engine coupled to the axis of the blower. These blowers, which were the largest size made, had a capacity of nearly 440,000 cubic feet per hour apiece. It was soon found, however, that the Roots blowers, which, in the smaller sizes in which they had been used elsewhere had answered well, had not been perfectly satisfactory in this large size. Their chief fault had been that if the room could not be maintained in cold weather at the normal temperature, the blades of the blower rubbed against the walls of the casing owing to the unequal expansion of the fan and casing. Heating of the blower then ensued; and it had to be put out of action. This difficulty could doubtless be overcome; but as the capacity of one blower was too small for the contemplated extension of the plant, and it did not appear advisable to construct larger Roots blowers, it was decided to adopt some other system

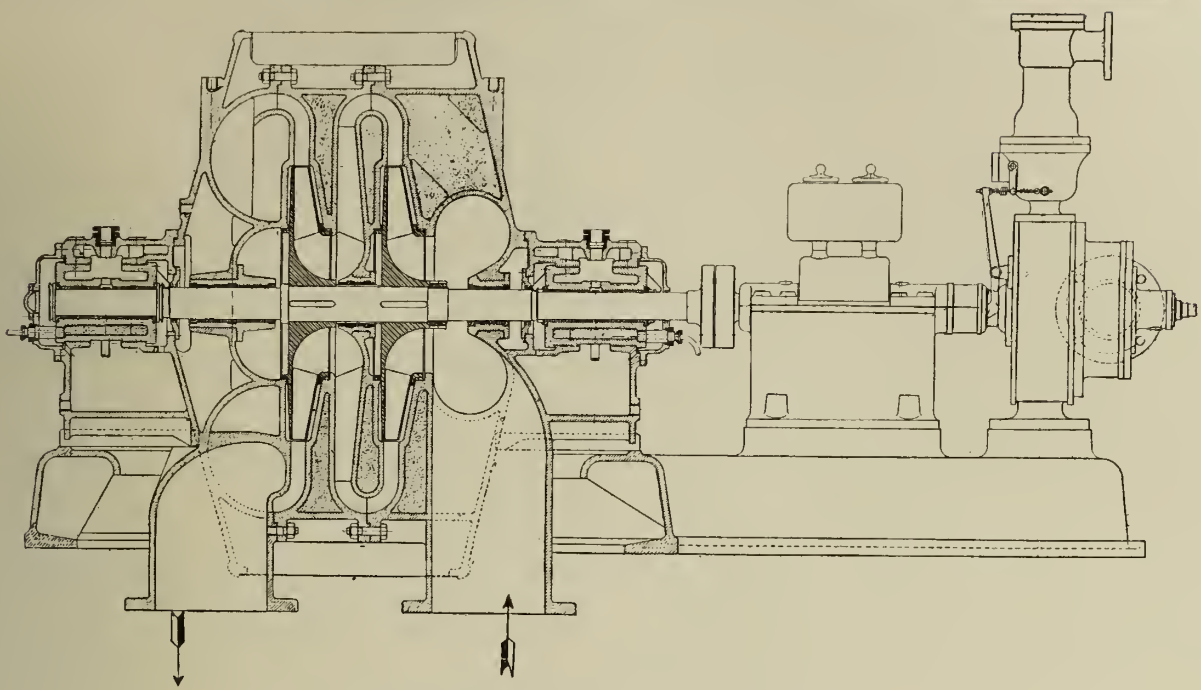
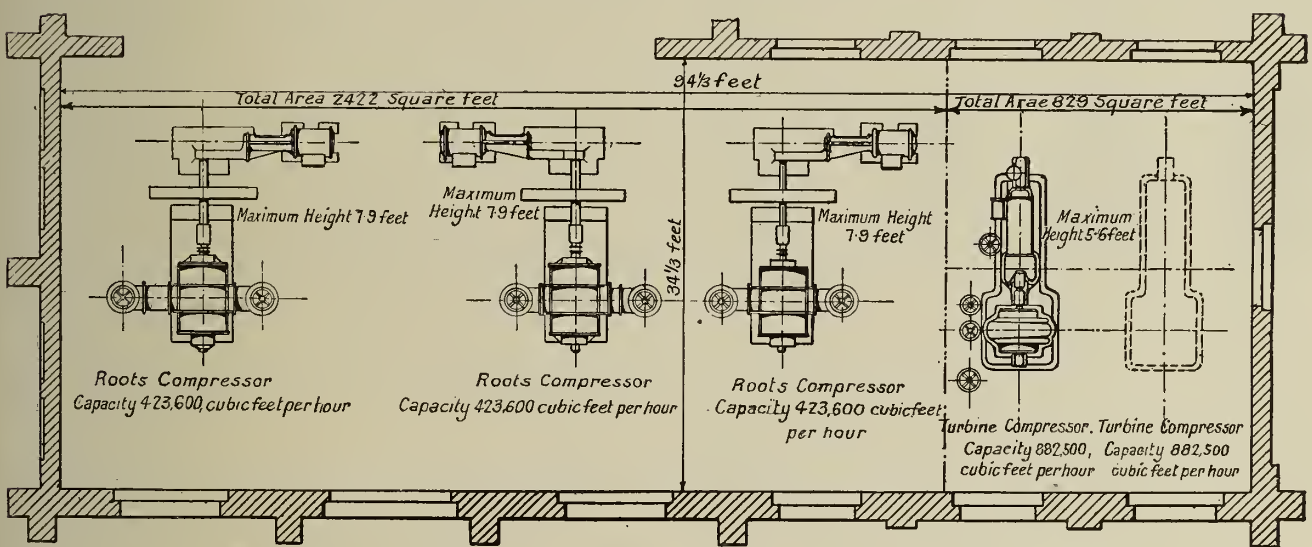


Fig. 1.—Laval Steam Turbine, with Rateau Compressor.



Capacity of Roots Compressors . . . . 3 × 423,600 = 1,270,800 cubic feet per hour.
,, ,, Turbine Compressors . . . . 2 × 882,500 = 1,765,000 ,, ,, ,,

Fig. 2.—High Pressure Plant at the Mariendorf (Berlin) Gas-Works.

entirely. The alternatives were either a reciprocating or piston compressor or centrifugal blowers working in successive stages. There were in the room in which the plant was to be erected gas apparatus with water seals, and this rendered the introduction of gas-engines or electro-motors out of the question.

The application of turbine blowers to blast-furnaces, in regard to which the firm of Brown, Boveri, and Co., of Baden, in Switzerland, had taken a prominent position, led to their being approached as to the practicability of applying steam-turbines to the driving of blowers. Last year this firm was commissioned to supply a Parsons turbine of 156-H.P. coupled directly to a Rateau blower working in two stages, subject to the condition that the blower should pump 875,000 cubic feet of gas per hour against a pressure of 48 inches of water. The steam consumption with condensing was not to exceed 22 lbs. per horse-power-hour. It was further stipulated that the pressure was never to vary by more than 5 per cent., even with fluctuations in the draught on the main of as much as 50 per cent. When tested, the installation showed a capacity of 1,050,000 cubic feet per hour at 3200 revolutions. All the other conditions were fulfilled, though for the time being an automatic governor has not been put in. When this has been done, no doubt the stipulated degree of uniformity of pressure will be maintained automatically. The arrangement of the plant alongside the previously erected Roots blowers is shown in fig. 2. The manner in which the stuffing-boxes of the blower are made tight is interesting. With the large number of revolutions at which the turbines work, an elastic packing could not be used. The joint is made tight by turning a groove in the bearing all round the shaft and keeping this groove filled with water and under hydraulic pressure. The water consumed for this absolutely tight joint is quite small.

The turbine blower has been in use every day since November last, and has given every satisfaction. The steam consumption of 22 lbs. per horse-power-hour must be considered good for such a small engine; and the oil consumption is practically *nil*, as the oil-tank after four months working has not yet been replenished. One advantage of the plant over other gas pumping plant is that the gas-valves need not be opened till the blower has been started and attained full speed. It is thus possible for one man to attend to the whole plant; whereas the old plant always wanted two or three men. The space required for the plant is also smaller, as two turbine blowers, having a joint capacity of 2,100,000 cubic feet per hour, can be erected on the site of one Roots blower of 420,000 cubic feet capacity. Exact figures as to cost cannot yet be given; but it may be said that the plant is considerably cheaper than the former one per unit of capacity.

In the discussion which ensued on the reading of these two papers, Herr Schöneberg, of the Tegel Gas-Works, Berlin, asked Herr Pfudel to say just how the tar which was separated in the blower was taken off, and whether it did not entail frequent cleaning of the apparatus. It was stated in reply that the tar was flung through screens and then ran into an ordinary syphon-pot, from which it passed into the tar-well. Once in every three or four weeks the blower was cleaned on a Sunday. The blower was situated about 400 feet away from the retort-house, and took the place of an ordinary exhauster. The gas had previously passed through an atmospheric condenser and a Reutter tubular condenser. From the blower it flowed into a tar-separator, and thence into the washers.

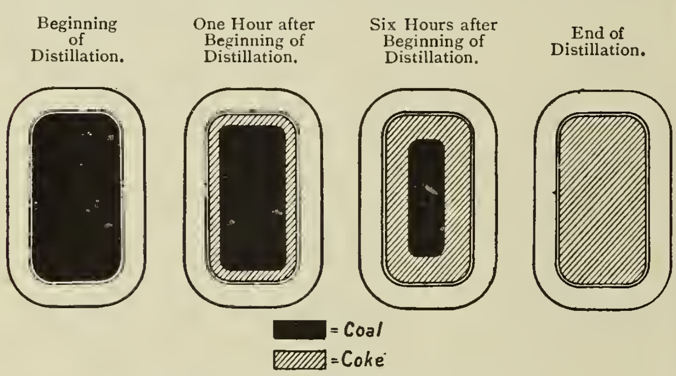
We have received from the Kramers and Aarts Water-Gas Company, Limited, a booklet containing illustrated descriptions of various installations of their plant in large and small gas-works. They are preceded by some explanatory particulars of the system, the points of particular interest in connection with which are fully set out. As our readers are aware, the Company have a very large installation of their plant at Amsterdam, its daily capacity being rather more than 2 million cubic feet; and fine views are given of it in course of erection.

THE PROCEDURE OF GASIFICATION IN VERTICAL RETORTS.

By Dr. J. Bueb, of Dessau.

The following is a slightly condensed translation of a communication on this subject by Dr. J. Bueb, the inventor of the Dessau type of vertical retort.

The author, in an earlier communication,* expressed the view that the greater part of the gas produced in vertical retorts ascended through the cool middle part of the retort. This view has been contested in various quarters; and in a number of communications the opposite view has been maintained—viz., that in vertical retorts the gas produced does not ascend through the middle, but between the wall of the retort and the coke. If this latter view were correct, the gas made in any conditions would have to traverse a highly-heated layer of incandescent coke before leaving the retort, as will appear from the following consideration. The gasification of the coal, and the consequent formation of coke, begin immediately fresh coal is charged into the highly-heated retort, and progress from the wall of the retort inwards. After a short time, a thin layer of coke is formed near the retort wall, and after the lapse of an hour it will have attained a thickness of from 2 to 3½ inches, and be at a red heat. This layer of incandescent coke has by this time become the conducting medium by which the heat of the retort is transmitted to the inner layers of coal, which become smaller as the layer of coke grows. When the layer of coke has advanced inwards from all sides to the middle line of the retort, distillation is finished. The illustration shows the progressive stages of distillation.



Course of Gasification in Vertical Retorts.

If, therefore, the gas produced ascended not through the still unchanged layer of coal in the interior of the retort, but by the walls of the retort, the whole of the gas almost from the time of charging would have to traverse an incandescent layer of coke. It is well known that coal gas, when heated to a temperature of 800° to 900° C. (say, 1470° to 1650° Fahr.), is altered in chemical composition by the decomposition of the heavy illuminating hydrocarbons into carbon, hydrogen, naphthalene, and other hydrocarbons. Nevertheless, the author deemed it important to obtain experimental proof that coal gas cannot traverse even small layers of incandescent coke without suffering profound decomposition. At his suggestion, some instructive experiments were undertaken with this object in view in the laboratory of the German Continental Gas Company. The conditions obtaining in a vertical retort an hour after charging were reproduced artificially in the following way: A piece of coke, about 2½ inches in length, was put into a porcelain tube, 1·1 inch in diameter, so as to be a good fit; and the crevices between it and the walls of the tube were rammed full with coke dust. Coal gas was then passed through this piece of coke when it had been raised to various temperatures. The loss of pressure resulting was measured; while the composition of the gas was ascertained by analysis. The results are shown in the following table:—

Temperature in the Tube.	Loss of Pressure.	Composition of the Gas. Volumes Per Cent.							Quality.
	Tenths of an Inch.	Carbon Dioxide.	Heavy Hydrocarbons.	Oxygen.	Carbon Monoxide.	Methane.	Hydrogen.	Nitrogen.	
Cold	3·1	0·5	3·1	0·1	5·3	33·8	52·6	4·6	627 B.Th.U. per cub. ft.
500° C.	8·7	0·8	2·5	0·2	5·4	32·1	54·1	4·9	
700° C.	11·0	1·0	2·8	0·2	5·3	29·6	56·6	4·5	
800° C.	11·8	0·8	1·4	0·1	5·4	26·5	58·8	7·0	Illuminating power greatly reduced.
900° C.	12·6	0·8	0·4	0·0	5·3	23·45	63·6	6·45	497 B.Th.U. per cubic ft. Illuminating power nil.

* See "Journal," Vol. XCI., p. 807.

It is apparent from this tabular statement that coal gas is so changed in composition by passing through even a relatively thin layer of incandescent coke that it is completely deprived of illuminating power, while the heavy hydrocarbons are almost wholly decomposed. In addition to this decomposition of the heavy hydrocarbons, there is at the same time partial destruction of the methane. The volume of gas thereby undergoes considerable increase. The coke, which had previously been porous and silvery white, at the end of the experiment had its surface blackened with soot, and its surface-pores closed with fine deposited carbon. It was interesting to observe that the deposition of carbon extended only a few millimetres into the interior of the piece of coke, and the blackening only went deeper in where there were fissures in the coke. It may hence be concluded that a properly incandescent layer of coke will decompose coal gas though it is only a few millimetres deep.

The rapid and heavy increase in the loss of pressure which the gas suffers on passing the incandescent lump of coke, must be ascribed to the separation of carbon closing the pores. Further, not only does the illuminating power of the gas disappear on passing through the incandescent layer of coke, but the calorific power also falls off very considerably—viz., by 20·8 per cent.—owing to the destruction of the heavy hydrocarbons and the partial suppression of the methane. After it had traversed the incandescent block of coke, the gas was passed through a condensing worm, artificially cooled to about 35°-36° Fahr. There was a heavy deposition of crystals of naphthalene on the walls of the glass condensing tube. Experimental proof was thus afforded of the heavy formation of naphthalene by the passing of coal gas through incandescent coke.

Some further experiments were made with the object of studying the action of steam in the presence of coal gas on the incandescent coke blackened with soot. After a piece of coke had been thus coated with soot by passing coal gas through it in a porcelain tube at about 900° C., as already described, coal gas supersaturated with steam was passed through the coke for 1½ hours at a temperature of about 900° C. Considerable formation of water gas took place in addition to the decomposition of the coal gas. The quantity of gas increased from an initial volume of 159 litres to 238 litres, or by about 50 per cent. The resultant gas had the following composition:—

Carbon dioxide	1·4	volumes per cent.
Heavy hydrocarbons	0·2	,, ,,
Oxygen	0·0	,, ,,
Carbon monoxide	23·6	,, ,,
Methane	13·8	,, ,,
Hydrogen	58·0	,, ,,
Nitrogen	3·0	,, ,,

The most interesting result of the experiment was the fact disclosed that the carbon previously deposited in the form of soot by the decomposition of the hydrocarbons was only partially consumed by the steam in the formation of water gas; whereas the coke itself was at the same time drawn upon for water-gas production. It may hence be concluded that the molecular carbon separated through decomposition of the hydrocarbons, despite its state of fine division, is not in any way more ready to react than the carbon which is present in the form of coke.

The experiments recorded are capable of being extended in various directions, and are not yet to be regarded as exhaustive. Perhaps they may prompt a continuation and extension of such investigations by other and more scientific bodies—such as the experimental works of the German Association of Gas and Water Engineers.

The results of these experiments, however, establish the fact that by passage through even a very thin layer of incandescent coke coal gas completely loses its character as an illuminating gas, owing to the decomposition of its heavy illuminating hydrocarbons; while per unit volume it suffers a heavy fall in calorific power. If the view were correct that in vertical retorts the gas passes up between the wall of the retort and the block of coke, it is obvious, having regard to the high heats at which these retorts are worked, and to the speedy formation of a layer—thin indeed at first—of incandescent coke between the wall and the uncarbonized coal, that the gas would be subjected to the radical decomposition which has been shown to ensue when coal gas passes through such a layer of coke. Hence if the coal gas before it escaped from the retort really traversed this layer of incandescent coke alongside the wall of the retort, it is clear that the vertical retorts would not yield any illuminating gas at all. But practical work has proved that the gas produced in vertical retorts has a higher illuminating power, and represents a higher yield per ton of coal carbonized of heavy hydrocarbons, than the gas obtained in ordinary horizontal or inclined retorts. Further the experiments indicate, by analogy, that there should be a continuous rise of pressure, from the beginning of distillation onwards, in the lower part of the retort. As a fact, the reverse is found to be the case.

The procedure of gasification in the vertical retort is, in the author's view, as follows: After the charge of coal is introduced into the highly-heated retort, there follows at first—particularly in the lowest and hottest portion of the retort—a sudden and great

evolution of gas. The coal directly in contact with the wall of the retort evolves coal gas rapidly and freely. In this first stage of all in the distillation there is not present any layer of incandescent coke, and the gas impinges at once on the highly-heated wall of the retort and is there decomposed for the most part. Carbon is deposited from it, and, owing to the great heat to which it is exposed, separates in the form of graphite. This state of things, however, passes very rapidly, and after quite a short time a thin layer of coke is produced by the great heat of the wall of the retort. This layer constitutes a protecting coating between the hot wall and the gas rich in hydrocarbons which is being produced in the interior of the retort. After the formation of this coating, the gas produced strikes against the incandescent layer of coke, and, by deposition of soot, makes it impermeable to gas; so that the rest of the gas made must, for the most part, ascend through the interior cold core of coal, and be thereby protected from further decomposition. It may be that, at a later stage in the distillation, the specifically much lighter gas, poor in hydrocarbons, which is then produced, has passed through a core of incandescent coke and ascended between the retort wall and the coke. This might specially be the case when the steam produced in the distillation of the coal had, by the consumption of carbon, opened up ways and passages through the coke. But this remains to be proved. In any case, the author considers it established that the coal gas proper, with its heavy hydrocarbons and high proportion of methane, escapes by another way—viz., through the interior cold part of the retort.

The part which steam has been shown by the experiment already reported to play in the procedure of gasification, affords an explanation of the large make of gas in the vertical retort. The steam which is continuously produced in the distillation of coal will always find ready to hand—especially during the second half of the period of carbonization—incandescent coke with which it will partially interact and form water gas. This involuntary formation of water gas, however, naturally increases the make of gas per ton of coal. These considerations also afford a natural explanation of the increase in the number of calories obtained in the total yield of gas.

The view that the gas ascends between the coke and the wall of the retort has doubtless been derived from observation when the upper lid of the retort is opened at the close of carbonization. The coke, especially at the top, generally has come away from the retort wall—more or less, according to the description of coal carbonized. Small flames dance out of the intervening space, and hence the erroneous impression may readily be formed that the gas during distillation has also taken the same course. This impression, however, does not accord with the procedure of distillation as described above. Conditions of draught and pressure are quite different when the lid is open from when it is shut.

All the phenomena of vertical retort working, as distinct from those of horizontal retort working, are explicable in a perfectly natural way by means of the procedure of carbonization which has been formulated in the foregoing. These phenomena are: (1) Greater yield of calorific and illuminating value in the gas per ton of coal carbonized. (2) Increased make of gas. (3) Absence of thick tar. (4) Great decline in the amount of naphthalene in the gas and tar. (5) Increased yield of ammonia. (6) Decreased yield of cyanogen.

The chief argument of those who oppose the author's view is that much scurf is produced, especially in the lowest and hottest part of the vertical retort. This formation, however, is naturally explained by the above considerations, according to which the production of graphite or scurf is only to be regarded as an initiatory occurrence at the commencement of distillation.

The Cheapest Gas in Germany.

It is announced that in June last the Municipality of Königsberg, the capital of East Prussia, decided to grant a rebate of 20 per cent. on the amount payable for gas consumed for heating rooms, provided the supply was taken through a special meter. As the price of gas for heating and cooking purposes in the ordinary way was already only 12 pfennige per cubic metre (3s. 4⅝d. per 1000 cubic feet), this rebate brings the price of gas for heating down to about 2s. 8½d. per 1000 cubic feet, which is, we believe, the lowest price now obtaining for town gas anywhere in Germany. The rebate may be secured also during the winter months on all gas consumed in excess of 5250 cubic feet per month through a meter supplying gas for both heating and cooking purposes. The announcement is interesting, as affording proof of the success of the efforts of Herr Kobbert, the Manager of the Königsberg Gas-Works, to make gas at the lowest possible cost. His views on the manufacture and use of water gas, and on the proper calorific power of a town gas supply, have frequently been reported in the "Journal." His achievements in cheapening production, and in popularizing the use of gas for heating, are doubtless responsible for the tentative selection of Königsberg for next year's meeting of the German Association of Gas and Water Engineers.

Dr. George Frederick Deacon, formerly Borough Engineer and Water Engineer of Liverpool, and President of the Association of Municipal and Sanitary Engineers, who died on June 17, aged 65, intestate, left estate valued at £28,762 gross, with net personalty £26,684.

IRISH ASSOCIATION OF GAS MANAGERS.

ANNUAL GENERAL MEETING IN DUBLIN, AUG. 10, 1909.

PRESIDENTIAL ADDRESS

of Mr. F. T. EUSTACE, of Tullamore.

Gentlemen,—My first duty is to thank you most sincerely for the great honour you have conferred upon me in electing me as your President for the past year. It is an honour I esteem most highly, especially as there are undoubtedly several men in our Association much better qualified to fill the important position. My duties for the past year have been very light; but I feel that I am hardly able to meet the duty imposed upon me at this meeting—namely, that of delivering an address which will commend itself to you and bear any sort of reasonable comparison with the able addresses that have been delivered to this important body by Presidents who have gone before me. I rely, however, upon your kind consideration; and I have no doubt you will, in your usual good spirit, overlook any of my shortcomings.

Another year has quickly run its course since we met together in our Association to discuss those important questions which interest us; and at its conclusion, reviewing it, I think we may congratulate ourselves that the gas industry has maintained its normal rate of progress, and commands the support of the public to-day more than ever before.

The gas-works which I control are comparatively small. When I look around the room and see the faces of gentlemen from whom I have often received valuable instruction, my mind naturally reverts to the immense interests which are committed to their care; and it is then that I appreciate the brotherhood that exists between us, which has resulted in placing me in this distinguished position to-day. I do not fear that any considerable assault can be made on the impregnable position of the gas industry, when its fortress is defended by the men whom I see around me. Electricity and other forms of light, which are going to cost nothing, as we read frequently in the Public Press, are to come as free gifts from the gods, who haunt the daily steps, and even disturb the sleep of gas managers. But I am convinced they are only phantoms of ghosts that really have no power except, perhaps, to quicken our zeal to make our light more beautiful and more revealing still.

I wish now, particularly, to-day to refer to one of many agencies with which our profession is connected which contribute to the general strength of our position—that is, to the manufacture of sulphate of ammonia, which is one of the greatest fertilizers known. So that while our main business is to dispel the darkness of the night so also are we assisting to dispel the gloom that hangs over the agricultural industry of this country.

It is my intention to read a paper embodying my experiences in connection with the working of a sulphate plant where I have the honour to be employed; and I will not elaborate upon the different matters pertaining to the gas industry, or the general principle underlying its successful working. Before claiming your attention to the paper I shall have the pleasure of reading presently, I should like to take the opportunity of saying how much importance I attach to gas managers identifying themselves with one or more of the several Associations in existence, and helping on these bodies by attending personally at their meetings whenever possible. We are living in an age of keen competition in every sphere; and the tendency among every class is to combine. I may safely say, without the slightest fear of contradiction, that there is no industry where combination is more necessary than in the gas industry. With the various other new illuminants that are constantly coming on the market, it is important that we should combine to hold our own, and show others that we are doing so.

THE POSITION OF GAS MANAGERS.

Independently of this altogether, gas managers must educate themselves in the various technical matters relating to their profession. Whatever view may have been held in the immediate past as to the qualifications for the successful gas manager, the future holds out no hope for the success of an easy-going policy; and I do most certainly consider that these meetings of technical men are an invaluable factor in the continuous process of our education. Personal mental attention enables us to discard much that is of no real service, and to replace it with new lines of thought which generally open out hitherto unexpected fields of endeavour.

It is a matter of personal everyday knowledge that a keen personal discussion results in modifying our views of the matter in question, and, consequently, our actions. I therefore consider that the mere reading of "Transactions" as published in our Technical Press, does not by any means satisfy the true requirements either of our own education or the advancement of the industry with which we are connected. It may appear, perhaps, at first sight a far-cry for some of our gas managers in charge of small country works—and there are many such, especially on this side of the Channel—to concern themselves with the latest developments in (say) carbonization in bulk, calorific tests, high-pressure distribution, filament lamps, and so on; but a moment's

reflection will, I think, bring home the fact that no acquired knowledge is wasted. Stagnation, especially in these days, is a useless policy; and a well-considered line of progress, suited to the conditions of the case, is an all-round asset to all concerned. There never was a period, like the present, when there was so great a demand for better methods and a cheaper article, and such intense competition.

I have heard that both petrol and acetylene gas plants find ready markets in this country, not only for use in places where gas is not (which is their legitimate sphere), but in places where gas is already installed—the cost of coal gas being such as to offer an opening to the rival illuminant. Therefore, every advance made in new methods of carbonization and distribution (both low-pressure and high-pressure apparatus) for utilizing our product to the best advantage, and last, but by no means least, the commercial methods by which our business is conducted, are matters of real and vital interest to us all, no matter how small our works may be. It must not be forgotten that a small gas-works often offers an excellent opportunity for testing a new idea; whereas there is perhaps not time in the rush of a busy works, or may be, space is lacking to give it the attention which its merits warrant. It is therefore with both these views in mind, which I have attempted to touch upon, that I lay before the Association a short paper on one point of what might be done in a small works.

INSTALLATION AND WORKING OF A SULPHATE PLANT.

It is with some diffidence that I venture to lay before you to-day a few particulars relating to the installation and working of a sulphate of ammonia plant. I say with diffidence, inasmuch as one is so accustomed to reading and hearing of the details of large sulphate plants, so especially common in the larger works of our fellow managers on the other side of the Channel, that the plant which I purpose dealing with may, by comparison, appear insignificant.

My reason, however, for dealing with such a subject is, that the question had been often raised whether it is commercially practicable to instal such an apparatus in a small works—say, about the capacity of 10 million cubic feet per year; and in order that the subject may perhaps be somewhat clearer to those considering the *pros* and *cons*, I have thought that the experience I have had of the working of a sulphate plant on a small scale might be of interest, if not of value.

The works I have the pleasure to preside over makes $7\frac{1}{2}$ million cubic feet per year, and uses at present Scotch Twechar coal; the average make per day per mouthpiece being about 5000 cubic feet. There is no special apparatus for separating the liquor and tar beyond the usual arrangements of baffles in the tar-tank. The liquor is stored underground; the capacity of storage being 4500 gallons. The washing plant consists of a Cockey washer only, 10 ft. by 1 ft. 6 in. by 3 ft. 6 in.; and the liquor is worked up to 5° Twaddel, or 10-oz. strength. Previous to the introduction of the sulphate plant, the ammoniacal liquor had to be carted out to the country, at heavy expense, for disposal; and as the difficulties of this method increased, some alternative had to be found. After much consideration, it was decided to instal a sulphate plant, though it was a matter of some doubt at the time whether it would prove a commercial success, apart from a means of relief from the liquor nuisance.

The capacity of the sulphate plant is 10 cwt. per day. It consists of two stills, 14 ft. by 22 ft. and 6 ft. by 2 ft.—one for the "free" ammonia and the other for the so-called "fixed"—and a solid-plate saturator 1-inch thick, 3 ft. by 2 ft. 9 in. by 2 ft. 3 in., which is fitted with a 2-inch "G. B." exit for ammonia and a 3-inch cast-iron pipe for the waste gases. The superheater is 8 ft. 6 in. by 1 ft. 6 in., and contains three iron pipes. The acid tank is made of timber lined with sheet lead. It holds 10 gallons of acid, and is fixed about 8 feet from the saturator. There is a 1-inch pipe from this tank, with an earthenware cock attached, which conveys acid from the tank to the saturator. The liming apparatus consists of a round metal tank, 3 ft. 6 in. by 2 ft. 6 in. deep. It is fixed close to the free still and connected to the fixed still by means of a steam-injector.

When working, the lime (which is made locally) is placed in a loose texture bag, and well worked about in the water of the tank until a good mixture of smooth cream of lime is obtained. The liquor, meantime, has been pumped to an overhead tank, so as to obtain a constant steady flow through the apparatus, and steam is admitted to the still at 6 lbs. pressure per square inch, as shown by the gauge. The stills consist of a number of trays and hoods with serrated edges; and the steam bubbling through the edges of the hoods from tray to tray thoroughly agitates the incoming liquor, and by its heat liberates all the "free" ammonia. The partially distilled liquor then passes to the second or "fixed" still, where it meets with the cream of lime solution, which is forced in with the aid of a steam-injector. The bubbling and agitation are repeated; so that every particle of lime is brought into intimate contact with the fixed salts of ammonia, when the lime, being a stronger base than the ammonia, drives the latter forward to the saturator. The spent liquor and lime then pass away to the sewers. No trouble is experienced thereby, as our make is so small; otherwise, of course, we should have to instal the usual precipitating tanks, and run the effluent only to the drains.

The liberated ammonia, as well as other gases, such as sulphuretted hydrogen, &c., travel forward to the saturator, where they meet a solution of sulphuric acid, which combines readily with the ammonia to form the well-known sulphate; leaving the other gases, and also some steam, to pass away through the superheater, wherein they part with their waste heat to the cold liquor on its way to the still for treatment.

The acid is raised from the store into the saturator by a steam injector, and the solution is made up to about 60° Twaddel at the start of operations, and allowed to run down to about 56° Twaddel, when it is ready for fishing. The crystals of sulphate are allowed to well drain, and are then removed to the store, which is 8 ft. by 7 ft. 6 in. by 3 ft. 6 in., lead covered.

The waste gases from the saturator pass through the condensers, which are composed of a run of 3-inch cast-iron pipes, six in number, and then to the purifier, which is nothing more than a heap of oxide with a small pit in the centre 3 ft. by 1 ft. 3 in. wide by 9 inches deep, for the 3-inch pipe to deliver the waste gases. This pit is covered with a wooden grid, and the oxide is heaped on to it to a height of about 2 feet.

The liquor which drains away from the superheater consists of water (derived from the steam used) containing a large proportion of sulphuretted hydrogen (liberated from the fixed ammonia on its contact with lime), and is commonly known as "devil liquor," from its offensive odour. This liquor forms one, if not the chief, of the drawbacks to the manufacture of sulphate. Up to the present, our make being so small, no difficulty has been found in draining it away into the soil of the works after conveying it some little distance from the plant. We work usually six days per month. One man is engaged when making sulphate. For such a small plant, worked irregularly, I consider the colour of the salt obtained is very fair.

The plant had been a minimum of trouble, though after it had been running a couple of years, we commenced to get a bluish salt, which caused considerable anxiety. Watch was kept on the working of the saturator for any indications of local alkalinity, and the working of the stills was carefully regulated. The trouble, however, continued. It was decided at last to open the saturator; and when this was done, the cause was found to be that the contractors had fitted an iron top instead of a lead covered top, and that, in consequence, the cyanides of the gas had attacked the iron, resulting in the formation of prussian blue. The substitution of a solid lead top remedied the matter, and no further trouble has been experienced in obtaining a good colour salt.

As to the commercial side of the position, the following figures have been got out, based upon the rate per ton of salt made :—

Wages in manufacture	£0	15	0
Acid used per ton—1 ton	2	15	9
Lime ,, ,, —30 lbs.	0	1	4
Repairs, wages, and material	0	5	0
Coke used for steam—12 cwt.	0	10	0
Total	£4	7	1

The sulphate commands a ready local market, and buyers supply their own bags. The financial results to the Company are very satisfactory; and the necessary work connected with the plant runs as smoothly as the other operations at the works, though, naturally, at the commencement some little difficulties cropped up. For instance, after the plant had been started, great difficulty was experienced in obtaining salts. This was found to be due to the use of too much steam on the stills; and the consequence was a drop in the specific gravity of the acid in the saturator. The pressure was therefore reduced, with better results; but still the yield was not what was expected. The steam was therefore further reduced down to 6 lbs. (at which we still work); and this had the desired effect. Matters went on fairly well until one day it was noticed that the waste coming from the superheater showed a large increase, which, on testing, was found to consist of raw liquor. Upon taking the superheater apart, the three pipes which ran through it were found to be very much eaten away—thus allowing the liquor to bye-pass the stills. A heavier gauge pipe (galvanized) put this to rights, and we have had no further trouble.

Sulphate plants, according to my experience, require to be handled very nicely at the start, as I believe there is no set-rule for working them. This has to be gained by experience; but once the plants are fairly in hand, there is no trouble attached to the working of them.

I certainly would recommend all gas-works of a similar size to mine, or even smaller, to have a sulphate plant, increase their revenue, and probably abate a nuisance.

Formation of Carbon Monoxide in Gas-Producers.—This is the subject of an important paper in "Bulletin" No. 30 of the University of Illinois. In noticing the paper, "Nature" says the numerous theoretical works on the processes taking place in the fuel bed of the producer have been built up on a rather slender experimental basis, and the communication fills a decided gap in our knowledge. The experiments deal more especially with the rate of the formation of carbon monoxide in the reaction $CO_2 + C = 2\ CO$; previous researches being rather directed to the study of the final equilibrium than to the rate at which the reaction takes place. Three authors have contributed to the memoir—Messrs. J. K. Clement, L. H. Adams, and C. N. Haskins—dealing with the subject from the physical, chemical, and mathematical points of view respectively. The result of this collaboration is stated to be a valuable monograph, which cannot be neglected by anyone interested in gas-producers.

THE PROPOSED INTERNATIONAL UNIT OF CANDLE POWER.

In the "JOURNAL" for the 29th of June, an abstract was given of a paper on this subject read by Mr. CLIFFORD C. PATERSON, of the National Physical Laboratory, before the Physical Society. The author subsequently sent the full text of the paper, with permission to use it after it had been published by authority of the Society. As it appears in the current number of the "Philosophical Magazine," we reproduce it.

The intercomparison of light units between the National or other standardizing Laboratories of America, France, Germany, and Great Britain has been proceeding at intervals since 1905. The values which have been obtained for the ratios between the different units are now found to be in sufficiently close accord to warrant the establishment of a working basis of agreement between this country, America, and France in the matter of a common unit of candle power. The writer has been conducting the photometric measurements connected with the work in this country, and it is the intention in this paper to give the results of comparisons which have been made, and to explain briefly those facts connected with different standards concerned which have a bearing on the agreement which has been reached.

The possibility of agreement between the British and French units was demonstrated by Dr. Glazebrook in a paper on light standards read before the British Association at Dublin in 1908.* The chief factor in the present movement has been the desire of the authorities in the United States to establish one unit for both gas and electrical industries in that country; and the possibility of their adopting a unit which should be identical with those existing in Great Britain and France led them to take the initiative in an attempt to obtain international co-operation. The agreement which has resulted has the approval of the Metropolitan Gas Referees, and now forms the subject of an announcement which is reproduced in the appendix.†

It is not necessary for the purpose of this paper to enter into a detailed description of the various standard lamps and units referred to in the memorandum. Dr. J. A. Fleming discussed the question of light standards very fully in his paper before the Institution of Electrical Engineers, to which reference should be made.‡ Some facts, however, connected with the units in question have a more especial bearing on the experimental results, and should be borne in mind in connection with the table of ratios given herewith.

The British Unit.—As defined in the above-mentioned recommendation, the unit of candle power in this country is the Harcourt 10-candle pentane lamp burning in an atmosphere at normal barometric pressure, and containing 8 litres of water vapour per cubic metre as measured by a ventilated hygrometer.

A difficulty arises in the use of all flame standards in connection with the method to be employed for measuring the humidity. When flame lamps are burning in a closed room, it is well known that their candle power diminishes, due probably to the vitiation of the air in the immediate neighbourhood of the flame.|| Two standards will not necessarily diminish in candle power at the same rate; and it is therefore necessary to take readings after the air of the room has been changed and before the candle power of the lamps has had time to be affected. The method of measuring humidity must therefore be a rapid one; and it is now generally agreed that, from considerations of accuracy and quickness of reading, the ventilated hygrometer is the best instrument to use. In the German and French comparisons this has been used; but in the English comparisons (as reported to the Photometric Commission meeting in Zurich in 1907) the unventilated hygrometer was employed, and in the tables published in the proceedings of the Commission the author's results are given in terms of humidity measured by this instrument. The ratios tabulated in the present paper are corrected so as to be in terms of the ventilated hygrometer. In each case values are taken for the humidity at which each lamp, in the country where it forms the standard, is considered to give its nominal candle power.

The Unit of the United States of America.—In the initial adoption of a unit of candle power, the United States of America endeavoured to make its value as nearly as possible the same as that accepted at the time in this country.§ This was before Professor Vernon Harcourt and the Metropolitan Gas Referees had established the 10-candle pentane lamp on the present definite basis.

The American Institute of Electrical Engineers recommended the derivation of their unit from the Hefner lamp by increasing its value in the ratio of 0·88 : 1. This seemed at the time, from different observers' work, to be the most probable ratio between the Hefner and British units. The gas industry in America, however, did not follow this course, but developed their unit along the lines of the 10-candle pentane lamp.¶ The result is that there has been, up to now, an appreciable difference between the units adopted in the two industries in that country. The Illuminating Engineering Society and other bodies took the matter up energetically, and the Bureau of Standards at Washington now has the support of the leading institutions in America in defining the value of a common standard to be accepted throughout the States. This Institution has ascertained, by electric intercomparisons, the ratio of their present unit to those of Germany, France, and Great Britain respectively, and has arranged to adjust the value of the American unit as already indicated.

German Unit.—The unit accepted in Germany is the light given by the Hefner lamp burning in an atmosphere at normal barometric pressure, and containing 8·8 litres of water vapour per cubic metre. The researches of Liebenthal* at the Reichsanstalt, on the Hefner lamp and the variation of its candle power with atmospheric change, were the earliest systematic experiments undertaken of this nature, and are too well known to require more than passing mention.

French Unit.—The candle power unit adopted by the electrical industry in France is the bougie décimale. This is the twentieth part of the light given out by a square centimetre of platinum at the temperature of solidification. The unit was suggested by M. Violle and adopted by the Congrès International des Électriciens in 1881. This standard has been found very difficult to reproduce; and the French authorities still use the carcel lamp, burning colza oil, as the standard for all photometric work.

A determination of the value of the carcel lamp in terms of the Violle platinum standard has only been made once. This was by M. Violle himself in 1884.† Measurements were made by him using two or three photometric methods; and all his values except one showed the bougie décimale to be a little less than 4 per cent. greater than the carcel unit. A multiplying factor of 1·04 for the carcel unit was therefore given by him, and has been adopted ever since for reducing the values in terms of one standard to those of the other. As no account was taken by M. Violle of the pressure and humidity of the atmosphere in which the carcel lamp was burning, the accepted figure of 1·04 must be regarded as liable to a certain inaccuracy due to this cause. It should be remarked also,‡ that no correcting factor has as yet been determined for the variations in the candle power of the carcel lamp due to atmospheric changes. Hence, in the table given later on in the paper a correcting factor has had to be assumed in cases where the carcel lamp is corrected for a difference of humidity.

Accuracy of Comparisons.—It is well to explain, in giving the results of experiments, that different limits of accuracy must be attributed to photometric measurements of different types of standards. It is usual, in giving photometric results, to write down the fourth figure; but even in the *most favourable* circumstances this must be written small, and the value considered liable to an error of + or − 0·1 per cent. In the case of the best comparisons of electric sub-standards, this inaccuracy should not be occasioned by imperfection in the bench or photometer head, nor yet be attributed to the electrical measurements, but must, in the author's opinion, be attributed chiefly to want of constancy in the individual making the photometric observations.

In some of the comparisons which are tabulated, the electrical measurements are probably not so accurate as in others. The fuller appreciation, however, of the exact values of the national and international electrical units which has recently resulted from the labours of the International Conference, makes it possible now to attain an accuracy which leaves nothing to be desired from this point of view.

As matters now stand, undoubtedly the photometric comparisons in which the highest precision is attainable are those between properly seasoned electric glow lamps of the same coloured light. With a potentiometer which is accurate to one part in 10,000 and a substitution method of photometric comparison|| on a bench which can be read to 0·5 mm., an accuracy is attainable with a set of good sub-standards in which the fourth figure is almost definite. When, on the other hand, comparisons are made against or between flame standards, the probable inaccuracy is greater. How much the inaccuracy is must depend largely on the flame adjustments and the consistent behaviour of the standard in question. It also depends upon the accuracy of measurement of atmospheric conditions and the precise knowledge which we have of their effect on the light of the standard lamps.

It follows from this that a relatively large number of observations must be made, when using a flame standard, if the same order of accuracy is to be attained that is possible with a much smaller number of electric comparisons. It must further be remembered, when considering the question of photometric measurements to two or three parts in a thousand, that the estimation of the height of the flame in some lamps, or the exact reproduction of the standard conditions, may not be identical when carried out by different observers. Hence it is conceivable that, owing

* *Vide* British Association Report, 1908. "The Photometric Standard of the National Physical Laboratory;" also "JOURNAL," Vol. CIII., p. 713.

† The announcement referred to was given in the "JOURNAL" for the 18th of May last (p. 439).

‡ See also paper by the author in "Journal of the Institute of Electrical Engineers," Vol. XXXVIII., p. 271.

|| Report American Gas Institute, "Methods of Taking Candle Power of Gas," "Illuminating Engineer," 1909, p. 203.

§ Bulletin of the Bureau of Standards; Report to the American Gas Institute, on "A Unit of Light," "JOURNAL," Vol. CIV., p. 426.

¶ "The Working Standards of Light and their Use in the Photometry of Gas," Ch. O. Bond, Franklin Institute, 1908, "JOURNAL," Vol. CII., p. 29.

* "Zeitschrift für Instrumentenkunde," Vol. XV., 1895, p. 157.

† Séances of the French Physical Society, May to July, 1884.

‡ "Rapport de Trois Lampes," Laporte et Jouaust, Bull. Soc. Inst. des Elect. IIe Série, Tome VI., No. 58.

|| See "Photometry of Electric Lamps," by Dr. J. A. Fleming, M.A., F.R.S., "Jour. Inst. Elec. Eng.," Vol. XXXII., p. 144.

Table *giving Determinations of the Ratios of National Candle-Power Units from* 1903 *to* 1908.

Pentane = British. Bougie Décimale = French. Hefner = German. Bureau of Standards = U.S.A.

		Electric Comparisons.									Direct Comparisons.			
		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
Tests conducted by . .		Sharp, 1903.	Paterson, 1905.	Fleming, 1905.	Hyde, 1906.	Laporte & Jouaust, 1907.	Laporte, 1907.	Rosa, 1908. Spring.	Rosa, 1908. Autumn.	Laporte, 1908.	Paterson.	Liebenthal.	Perot & Laporte.	Photometric Commission, Zurich,* 1907.
Number of Lamps . . .		..	6	3	12	6	2	12	6	11	..	..	..	..
A	Hefner / Pentane Unit	..	0·89$_0$	0·88$_5$	0·89$_3$	0·90$_8$	..	0·89$_6$	..	..	0·90$_2$	0·90$_4$	0·92$_1$	0·90$_2$
B	Bougie Décimale / Pentane Unit	..	..	..	0·99$_8$	1·01$_8$	1·00$_3$	1·00$_8$	..	1·008	1·00$_9$	1·00$_9$	1·01$_9$	1·008
C	Bur. of Standards / Pentane Unit	..	..	..	1·01$_6$	..	..	1·015	1·01$_6$	..	..	..	..	..
D	Pentane Unit / Hefner	..	1·12$_8$	1·13$_0$	1·12$_0$	1·10$_1$	..	1·11$_6$	..	..	1·10$_9$	1·10$_6$	1·08$_6$	1·10$_9$
E	Bougie Décimale / Hefner	1·118	..	..	1·11$_6$	1·11$_3$	..	1·12$_4$	..	..	1·118	1·11$_6$	1·11$_7$	1·118
F	Bur. of Standards / Hefner	..	..	..	1·138	..	..	1·13$_1$	..	..	..	..	..	..
G	Pentane Unit / Bougie Décimale	..	..	..	1·00$_2$	0·98$_7$	0·99$_7$	0·99$_2$	..	0·99$_2$	0·99$_1$	0·99$_1$	0·98$_1$	0·99$_2$
H	Hefner / Bougie Décimale	0·89$_4$	..	..	0·89$_6$	0·898	..	0·89$_0$	..	..	0·89$_4$	0·89$_5$	0·89$_5$	0·89$_1$
I	Bur. of Standards / Bougie Décimale	..	..	..	1·018	..	..	1·00$_6$	..	..	..	..	..	..
J	Pentane Unit / Bur. of Standards	..	..	..	0·98$_4$	..	..	0·98$_5$	0·98$_4$	..	..	..	..	..
K	Hefner / Bur. of Standards	..	..	..	0·87$_9$	..	..	0·88$_4$	..	..	..	..	..	..
L	Bougie Décimale / Bur. of Standards	..	..	..	0·98$_2$	..	..	0·994	..	..	..	..	..	..

* Pentane values corrected to a humidity of 8 litres of water vapour per cubic metre of air.

to this cause, the observations in one laboratory on some flame standard may differ consistently by a small amount from those in another on the same standard. This, however, is not the case when electric sub-standard comparisons are made, if the electrical measuring apparatus is accurate. To a certain extent, therefore (in some cases more than others), a flame standard needs to be "interpreted" when its absolute value is desired to a high accuracy.

The value of electric sub-standards comparisons thus becomes apparent. If (as is generally the case) a laboratory has sets of electric sub-standards which have been compared at intervals for years with the primary flame standard whose value they represent, an opportunity is given for realizing the absolute value of this unit to an accuracy which could hardly be attained with certainty by others who might endeavour to reproduce it in a single set of observations, however carefully made. When these electric sub-standards are intercompared through the medium of a travelling set of lamps, there is no reason why we should not obtain accurate knowledge of the relative values of the different units as each is interpreted in the country where it is the recognized standard.

The ratios between the four units of light given in the table are the results of measurements which have been made at the specified laboratories in the four countries concerned. Other determinations were made previous to these; but the standards used for obtaining the British unit were of several different forms, and the atmospheric conditions have not always been taken into consideration. I have deemed it desirable, therefore, to insert only the more recent determinations, in all of which the 10-candle Harcourt pentane lamp has been used, and atmospheric changes have been allowed for.

The table is divided into two portions. Columns 1 to 9 give the various ratios obtained through the medium of electric lamps which have been measured at some or all of the laboratories. These have been chiefly initiated by the Americans, who have from time to time sent sets of lamps to Europe to have values assigned in London, Paris, and Berlin. It is not suggested that all the results in the table should receive equal weight. In some of the electric comparisons, the conditions allowed of a greater accuracy than in others, when fewer lamps were employed and time only allowed a single set of measurements to be made.

Columns 10, 11, and 12 contain the values which resulted from the intercomparison of flame standards undertaken at each of the laboratories. These were initiated by the International Commission on Photometry, and gave a set of ratios which brought the knowledge of the relative values of the candle-power units to within an accuracy of about + or − 1 per cent. As in the case of the electric comparisons, the conditions in some cases probably allowed of a higher accuracy than in others; but the results of all the measurements have been tabulated, so that the bearing may be seen of each on the agreement which has been established.

The first series of ratios (columns 1 to 9) may therefore be regarded as representing the ratios of the standards as they are interpreted in the countries to which they belong; while in the second series we have the interpretation of the values of the standard lamps by experimenters who are not so accustomed to their manipulation.

Lines marked A, B, C, give the values of the standards in terms of the pentane unit; D, E, F, give them in terms of the Hefner lamp; and, similarly, other sets are in terms of the bougie décimale and the Bureau of Standards candle.

Without going into detailed comments upon the experiments from which each ratio in the table is derived, it will suffice to say that, as far as the electric lamp comparisons are concerned, the greatest stress should be laid on the results in columns 4 and 7. This is partly on account of the large number of lamps employed, and also because of the more prolonged measurements made. Line J illustrates the high accuracy it is possible to secure in comparisons of this nature.

In the certification of glow lamps in terms of the Hefner unit, the Reichsanstalt only give candle-power values to the nearest 1 per cent. If the average of ten or twelve lamps is taken, the error introduced is probably not great; but when the number is small, appreciable inaccuracies may be introduced into the mean, and the rather low value obtained by Fleming in 1905 may be attributed to the fact that only three lamps were tested.*

As regards the flame-lamp comparisons, it will be noticed that Perot and Laporte (column 12) found a value for their pentane lamp which was appreciably lower than that obtained by other observers. Except for this difference, the agreement between the ratios is fairly close. The exceptionally close agreement shown in columns 10, 11, and 12 for the ratio "bougie décimale: Hefner" can only be attributed to a coincidence, since in the experiments

* See "Jour. Inst. Elec. Eng.," Vol. XXXVIII., p. 311: Discussion by Dr. Fleming of the author's paper on "Investigation of Light Standards."

from which two of the three ratios were determined the observations varied between 3 and 4 per cent. from the mean.

The chief point of interest in these comparisons is the near coincidence of the values of the bougie décimale with that of the pentane unit, as indicated by lines B and G. An inspection of these values indicates that the bougie décimale, as interpreted by the Laboratoire Central, may be slightly larger than the pentane unit; but the amount is less than 1 per cent. When we remember that, at present, the value of the bougie décimale depends on the interpretation of the carcel lamp and the ratio between it and the platinum unit, determined by Violle in 1884, it must be admitted that this small apparent difference is well within the limits of the errors of experiment.

The second point to notice is the difference of 1·6 per cent. between the units of the Bureau of Standards and the National Physical Laboratory.* It is generally recognized that the unit at present adopted by the gas interests in the States is about 4 per cent. smaller than the Bureau of Standards unit. It will then be seen that by lowering the value of their unit by 1·6 per cent. the Bureau comes into exact agreement with this country, and approximately halves the difference between the units employed by the gas and electrical industries in the States.

A further point of interest and importance which results from the comparisons (see line A in the table) is that the Hefner unit is in the ratio 9:10 to the new candle. The French authorities have for some time taken the ratio "Hefner: bougie décimale" as 0·895. It is of interest, therefore, to see, from lines A and H, how nearly the value for the Hefner unit, in terms of both pentane and bougie décimale units, approaches the figure 0·90. The mean of all the ratios "Hefner: pentane" comes to $0{\cdot}90_0$, and those of "Hefner: bougie décimale" to $0{\cdot}89_5$. So that though the comparisons between the pentane and bougie décimale units indicate a difference of 0·8 per cent., the same units compared through the Hefner standard only appear to differ by 0·5 per cent.

[Appended to the paper is the announcement referred to in the second footnote on p. 383.]

* Dr. A. C. Humphreys, Report of the Committee on Nomenclature and Standards, Annual Convention of the Illuminating Engineering Society, Oct. 5, 1908.

DUTCH GAS MANAGERS' ASSOCIATION.

General Meeting at Utrecht.

The Thirty-Seventh General Meeting of the Association of the Gas Managers of Holland was held on the 7th and 8th ult., in the Tivoli Park at Utrecht. The following report of the proceedings is taken from our Dutch contemporary, "Het Gas," which is the official organ of the Association.

The members of the Association were received and entertained on the evening of Tuesday, July 6, by the Gas Committee of Utrecht, on behalf of whom the Chairman, Alderman Dr. A. W. van Zijst, spoke a few words of welcome. The meeting was formally opened on the following day by the President of the Association, Heer J. E. H. Bakhuis, the Manager of the gas undertaking of The Hague, who delivered an Inaugural Address, of which the following is a summary.

President's Address.

The generally depressed industrial conditions of the year 1908 had had their effect on the gas industry. The smaller growth of population resulted in a smaller increase in the output of gas. Coal was bought at high prices, because most of the gas-works had concluded their contracts before the fall in the price of coal set in. The high cost of coal was not counterbalanced by the price obtained for coke, because the coke market followed the depression of the coal market. The prices of coal tar and ammonia were low, and up to the last no permanent improvement in them can be looked for. Coke-ovens were now recovering these products to a much greater extent; and the flooding of the market from England had always to be feared. For coal tar, however, a limit was set by its value as fuel. The year 1909 had opened more favourably for the gas industry, because of the low prices of coal and oil, which would effect a reduction in the cost of manufacturing gas.

Passing on to what had, it was known, been done since the previous summer towards the solution of the carbonizing problem, the speaker referred to the favourable results obtained from vertical retort-settings and from the Munich chambers with sloping bottoms, and to the advantage of continuing distillation with the former for a further hour and admitting steam during that time. Chamber carbonizers of other types had also been constructed. Large gas-works should give attention to the large-scale trials at Rotterdam, and small works to the small-scale trials at Maastricht. In England, endeavours to achieve continuous working appeared to have produced practical systems. The reports from Liverpool, where Messrs. Woodall and Duckham had erected plant, and from St. Helens, where there was a Glover-West plant, showed a good make of gas and yields of tar and ammonia, and coke of better quality; while quenching was almost unnecessary, little labour was required, and there was no dust or smoke. In a word, the working was ideal. Interesting results of carbonization at low temperatures, with the object of producing a smokeless fuel, had been published from Plymouth. The Municipality of Utrecht, and Heer Dr. J. J. Neurdenburg, the Gas Manager, deserved thanks for undertaking a trial of the Rincker and Wolter system of coal, oil, and tar gas-production, the results of which were being looked forward to with interest.

The object of all these methods was to lower the cost price of gas, and thus give the gas man an advantage in competing with electricity. Electricians advertised on a large scale the virtues of the new metallic filament lamps; and it now behoved the gas manager to direct attention to the inverted incandescent burner, which showed an economy of 30 to 40 per cent. compared with the upright burner. For public lighting, the inverted high-pressure gas light can hold its own with the most advanced arc lamp. Installations of it occur at Utrecht and at Rotterdam. Attention should be given to facilities for convenient and efficient attention to the gas-lamps, as in this respect electricity still had an advantage. Heer Brender-à-Brandis had started in May a first course of instruction in gas supply at the Technical College at Delft. There were also courses for gas-fitters at Amsterdam, Rotterdam, The Hague, and Haarlem. As proof of the vitality of the gas industry, it might be pointed out that new gas-works had just been finished, or were under construction, in fourteen Dutch towns or villages, and concessions for the supply of outlying places from other works were under consideration.

After referring to the Livesey Memorial Fund, and to the losses the gas industry had sustained by deaths in Holland (Heer F. A. Holleman, of Leyden, Heer G. Peck, of Amsterdam, and Heer S. R. Stokvis, of Rotterdam) and in Germany, the President stated that the membership of the Association had increased by 19 since last year, and now amounted to 416.

Officers for the Ensuing Year.

The election of officers for the year 1910 resulted in the choice of Heer J. van Rossum du Chattel, of Amsterdam, as President, and of Heeren J. Bauduin, of Maastricht, W. F. Payens, of Nijmegen, and M. C. Sissingh, of Rotterdam, as Members of the Council. Heer N. W. van Doesburg, of Leyden, was appointed Editor of "Het Gas," and Heer W. K. N. Geerling, of Amsterdam, was elected a member of the Committee for the Benevolent Fund of the Association. Brussels was chosen as the place for next year's meeting. The reports of the Treasurer and Auditors on the accounts of the Association, and of the Committee of the Benevolent Fund, were received; and the necessary elections in connection therewith were made for the ensuing year.

Report of the Photometry Committee.

The report of the Committee on Photometry of the Association stated that comparative tests, of which the results will be published, had been made with a Junkers calorimeter, and the new Simmance-Abady portable calorimeter. Reference was also made to the adoption of the "International Candle" as its photometric unit by the Bureau of Standards at Washington, and to the concurrence of the English and French laboratories in its general acceptance. The English Gas Institution had approached the Dutch Association with a suggestion that it also should accept the "International Candle" as its unit of light. The Dutch Photometry Committee, however, considered that before this was agreed to the "International Candle" should bade opted by the International Photometric Commission at Zurich; and this view was endorsed by the meeting. A sum of 250 florins (about £21) was voted for the expenses of a delegate of the Association in attending the Congress of the International Commission at Zürich next summer.

Report of the Coal Committee.

The Coal Committee of the Association reported that, though it had been at work for five years, little or no progress had as yet been made in accomplishing the chief object with which they were appointed—the establishment of a Central Association for the purchase and sale of raw materials and bye-products for Dutch gas-works. They are of opinion that this aim must be relegated to a distant future. It may be partially attained by those gas-works which are similarly circumstanced joining together, and ultimately, by enlarging their circle, effecting the object of the projected central organization. In a few cases, two or three gas-works have already combined for the purchase of raw materials. An attempt early this year of four gas-works to work together thus had, however, proved abortive. The Committee had received information from 26 gas undertakings in regard to the purchase of coal. Their report also gives a review of the gas coals purchased in 1908, and the quantities of tar, liquor, and sulphate made. Reference is made to the proposal Professor Constam, of Zürich, brought up at the recent Congress of Applied Chemistry in London, for the International adoption of the method of the American Chemical Society for the determination of volatile matter in coal, with a view to securing general uniformity in regard to the valuation of coal (see "Journal," Vol. CVI., p. 584). The Dutch Committee regard Professor Constam's proposal as a first step in the direction of attaining international agreement in the examination of coal. The Committee proposed, and the meeting agreed, that Dr. Terneden, of Amsterdam, should prepare a *brochure* to serve as the basis for an international conference on this question. It was anticipated that there would be a congress arranged to deal with it before long. The meeting voted the

necessary sums for the continuation of the work of the Committee and the preparation of the *brochure* referred to.

Other Technical Committees.

The Committee of the Association appointed to advise in regard to the training of gas-fitters reported on the sale of a "Handbook for Gas-Fitters" which had been prepared at the instance of the Association. They urged other gas undertakings to follow the example of those at Amsterdam, Haarlem, The Hague, and Rotterdam in providing courses of instruction for gas-fitters.

The Committee on the establishment of a standard of valuation for the purchase of gas oil reported that they aimed at adopting a method based on the quality of the oil as ascertained by laboratory trials. The members of the Committee have been conducting tests, from which it appears probable that they will recommend laboratory gas-making trials for the valuation of oil. But various investigations have still to be made before a clearly defined method can be propounded.

The Papers Presented.

Passing on to the technical communications, the first was a paper read by Dr. J. J. Neurdenburg, of Utrecht, on Oil-Tar Gas Manufacture. The process described by him is a Dutch invention, and is said to be simpler than carburetted water-gas manufacture, for which three vessels in series are required, whereas the new process needs only one vessel. The proportion of carbonic oxide in the gas can be kept below 5 per cent. At Utrecht, the gas is made from a mixture of two-thirds gas oil and one-third water-gas tar. After thorough mixing in a vessel with stirring apparatus, this mixture is fed into a reservoir and pumped thence into the generator, which is filled to about seven-eighths of its capacity with blast-furnace coke. The mixture passes through an oil-meter, and is sprayed on the bed of incandescent coke. The sequence of working is as follows: A "blow" or air-blast lasting 1½ to 2 minutes; introduction of oil and tar for 2 to 3 minutes; a downward run of air or steam of a quarter minute, for the purpose of avoiding the loss of the gas present in the generator; and a subsequent steam-blast of one minute, mainly in order to clean the sprayer. The "blow" is then started again. The valves, &c., are all operated from a central point. The whole apparatus at Utrecht, inclusive of two oil-tanks, cost about £8300. It has a productive capacity of about 620,000 cubic feet of gas per diem. A second set of plant, doubling the productive capacity, would cost rather less than £4000. There are consumed in the production of 1000 feet of gas, having a calorific power of 550 B.Th.U. per cubic foot and containing 5 per cent. of carbonic oxide, 62·4 lbs. of the mixture of two-thirds gas oil and one-third water-gas tar, and 3·1 lbs. of coke. The cost of the gas, as compared with coal gas and carburetted water gas, at the prices prevailing for coal, oil, coke, and water-gas tar in Holland, is as follows:—

Coal gas	1s.	11⅛d.	per 1000 cubic feet.
Oil-tar gas	1	10¼	,, ,, ,,
Carburetted water gas . .	1	7¼	,, ,, ,,

One advantage of the process is that, by increasing the temperature of the generator, gas of a very low specific gravity can be manufactured. The proportion of hydrogen can be raised to 85 per cent. without difficulty, so that the process is valuable for balloon supplies.

Communications were then made by Heer Smulders, of Utrecht, on a Fast-Running Exhauster in use at the Utrecht Gas-Works (which was subsequently inspected by those attending the meeting); by Heer J. Diephuis, of Amsterdam, on the Woodall and Parkinson Expansion Nipple; and by Herr F. Lux, of Ludwigshafen on the Rhine, on a New Electric Distance Lamp Lighter and Extinguisher. In regard to the last, it was mentioned that the number of applications for patents for distance lamp-lighters and extinguishers was over 200, of which 60 to 70 were for electrical devices. The Lux apparatus was stated to work without hitch, and to admit of any number of lamps being controlled from a central point. Although too costly for use in street lighting—new installations cost £4 to £5 per lamp—it should prove serviceable in large salons and buildings.

Heer Th. A. Van-der-Horst, of Delft, showed a water-slide fitting, which was free from the usual objectionable feature. If the water-seal in it were broken, no escape of gas occurred, but the lights were extinguished. A discussion followed on vertical retorts and carbonizing chambers. Retort-house governors, which have not hitherto found application in Holland, were next considered. Favourable results were stated to have been obtained in the East Indies by the use of coal and breeze as fuel for retort-furnaces in place of coke. Some discussion ensued on the use of coal tar as a fuel in boiler-furnaces. The question of the abstraction of naphthalene by slow condensation of coal gas was raised; and it was stated that Klönne's chamber condenser, which effects condensation gradually, causes more naphthalene to be taken up by the tar than is taken up with the quicker action of ordinary condensers. Washing the gas with heavy oils, anthracene oil, &c., has proved quite satisfactory. From 0·0145 to 0·0187 gallon of oil is required per 1000 cubic feet of gas. It was mentioned that modifications of the Jäger purifying grids, which had been made at the Amsterdam Gas-Works, had effected a considerable reduction in the wear and tear of the grids. The sediment, consisting of a great deal of water and a little tar and soot, which is obtained in carburetted water-gas manufacture, was said to depend largely on the quantity of scrubbing water used. The formation of a great quantity could be prevented by limiting the amount of water sprinkled into the scrubbers. A separator may be employed for removing the sediment from the water-gas tar. The admixture of warm coal gas with cold water gas was stated to result in the various oils, which otherwise would be deposited, being retained by the gas.

Tests of the Junkers self-registering gas-calorimeter had proved it to give trustworthy results. The Fahrenheim calorimeter had been tried at Dessau, Amsterdam, and Hilversum; and the tests had shown that as a scientific and technical instrument it was quite worthless. In consequence of complaints lodged with the Administrative Board of North Holland, of nuisance arising from the manufacture of sulphate of ammonia at the Eastern Gas-Works at Amsterdam, the question of the best method of rendering the evil smelling gases inoffensive was considered. The two most usual means of disposing of them—viz., leading them into a high chimney stack, and burning them in the grate of a boiler—were not satisfactory. The first means was ineffective, and the second was attended by corrosion of the boiler plate. A special furnace was therefore erected at Amsterdam, consisting of a grate with a superposed combustion chamber for the noxious gases. No trace of sulphuretted hydrogen could be detected at the outlet of this furnace, so that its action was satisfactory. But the fuel consumed raised the cost of manufacture of the sulphate of ammonia by about 8d. per ton.

The question of protecting thin steel pipes by coating was discussed; and the well-known Angus Smith method, which is commonly named in specifications, was condemned. At Amsterdam, it was stated that the pipes after warming were wrapped round with strips of jute soaked in melted pitch, and then painted therewith. The results were good. Mention was also made of the preparations for coating pipes of Messrs. Wm. Briggs and Sons, Limited, of London and Dundee. Discount or reduction gas-meters for use where gas for cooking or heating is supplied at a lower price than for lighting, formed the next subject of debate. The Thorp and Marsh pattern had given good results at Amsterdam and Maastricht. The firm of Elster and Co., of Rotterdam, also made a small gas-meter, which could be stamped at the Dutch Standards Department, and was sold for about 16s. 8d.

It was stated that the good results reported last year to have been obtained in Amsterdam with copper cellulose mantles for public lighting had been confirmed by further use. Various types of inverted burners were exhibited in the meeting room. Messrs. Pintsch showed a cradle for supporting the fragments of an inverted mantle in case of its fracture, so as to ensure some light being maintained in that event. It was reported that rubber connections to boiler-rings, &c., which were the cause of accidents, had been replaced at Amsterdam by copper tubing, which, owing to its greater durability, proved cheaper as well as safer. Instructions were given for articles to be published in "Het Gas" on Electro-Technology in so far as it bore on the competition of electricity with gas.

The festivities in connection with the meeting included a dinner and concert at the Tivoli Park on the 7th ult., and the official banquet at the Hotel Boschlust, at Zeist, on the next day, which also was followed by a concert. The meeting was attended by 193 members of the Association, including the honorary members Heeren W. de Liefde and C. T. Salomons.

Preventing Tar from Flowing from the Tar-Well.—Herr R. Pettner has taken out a German patent for a device for preventing tar from flowing with the ammoniacal liquor out of the tar-well. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," an overflow pipe is provided through which the liquor floating on the tar flows out into the reservoir. At the bottom of the limb of the pipe dipping into the liquor is fixed a saucer with a hole in the centre and with several short inclined pipes projecting downwards between its centre and circumference. From the central hole a short conical pipe rises within the overflow-pipe. As the liquor ascends in the conical pipe and then in the overflow-pipe, any entrained tar tends to settle and flow back down the outside of the conical pipe into the saucer, and thence through the short inclined pipes back into the well.

Improvements in Internal Combustion Engines.—The current issue of "Nature" contains the first of a series of articles on this subject, by Mr. H. E. Wimperis. The author considers that we are only at an intermediate stage in the development of the internal combustion engine, which gives us a bigger return for the heat put in than any other known form of engine. He says that it is impossible to imagine the development of the future "going back," so to speak, on such an advance as this. The internal combustion engine must come, and existing steam-engines be replaced. This means the supersession of the steam-turbine and the advent of the gas-turbine. Numbers of men are working at the problem which it presents; but little has as yet been published as to the result of their labours. This is a clear indication that the many difficulties are not yet mastered. The author thinks the present stage in the development of the internal combustion engine is a convenient one at which to summarize briefly what has been done in regard to its improvement; and therefore he proposes in this series of articles to state the problem and the lines on which, with such a striking measure of success, its solution has been attempted.

REGISTER OF PATENTS.

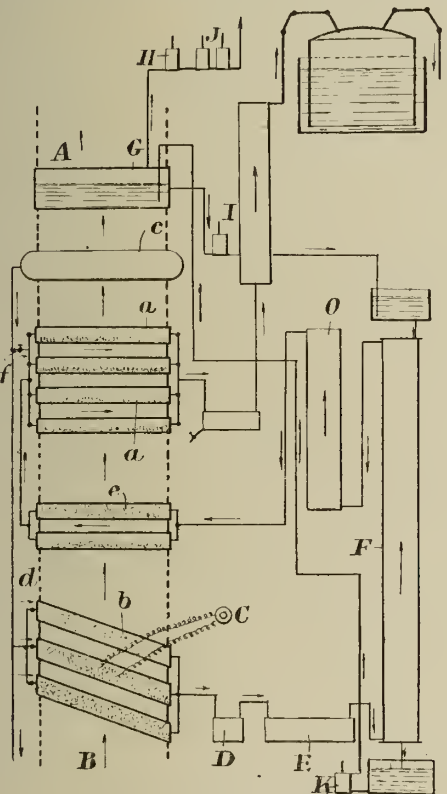
Manufacture of Methane or Mixtures of Methane and Hydrogen.

Sabatier, P., of Toulouse, France.

Nos. 14,971 and 27,045; July 14, 1908.

These applications (the latter of which was ante-dated from Dec. 12 to July 14, 1908) relate to a process and apparatus for the manufacture of methane or of mixtures of methane and hydrogen, by passing water gas over heated nickel.

Such manufacture, the patentee points out, has been effected hitherto by producing water gas in some suitable manner, depriving it of carbonic anhydride with the aid of an alkaline carbonate, and finally passing the gas over heated nickel. This process "has never produced good, practical results," on account of the following reasons: (1) The water gas constantly varies in composition, and as the whole operation is based on a definite composition of the gas, the process soon becomes defective; the hydrogenation becomes insufficient; the nickel is carbonized; and after a short time the operation has to be stopped. (2) The carbonized nickel has to be regenerated; and an operation of this kind requires time and expense. Either two sets of apparatus have to be used or else the carbonized nickel must be removed and replaced by a fresh quantity.



Sabatier's Methane Generator.

Attempts have been made to avoid the deposit of carbon on, and between, the particles of nickel by adding steam to the water gas. This process is, however, costly, owing to the auxiliary production of steam; further, "it has never produced satisfactory results, as the exact composition of the mixture of gases was not known." By using the process which constitutes the present invention, all these disadvantages may, it is said, be avoided, and the operation may be carried out in a regular manner without any interruptions.

The invention is characterized by the fact that the water gas used has a constant composition which is obtained by observing a constant temperature in the apparatus for producing it. The water gas is subsequently deprived of carbonic acid in two stages; it is treated first of all with sodium carbonate in any known manner, and is afterwards passed through a dilute solution of sodium hydrate. In this double operation for removing the carbonic acid, the gas becomes so moist that it can be passed on to the nickel for the purpose of combining it with the hydrogen without adding water vapour. No carbon is deposited in the process, and a mixture of gases is obtained that always contains the same proportions of methane and hydrogen.

I.—*Manufacture of Water Gas of a Definite Composition.*

The water gas is manufactured in apparatus A, fitted with bent tubes or straight, horizontal, or inclined tubes *b*. The superheated steam produced in the generator *c* passes through *d* to the coke (anthracite, wood, charcoal); the latter being heated by a furnace B heated with coal or (preferably) by the gases produced by a Siemens generator. A pyrometer C with constant indications—such as a Le Chatelier's thermo-electric pyrometer—will allow of the average temperature in the tubes *b* being determined. A cock *f* is provided between the steam-pipe *d* and the tubes *a*.

The composition of the water gas depends: (1) On the temperature of the coal; (2) on the nature of the coal. The higher the temperature, the smaller the proportion of carbonic acid. The amount of carbonic acid contained in the gases can easily be determined. If this is about 20 per cent. by volume, the gas is just in condition for the manufacture of pure methane. A reading is taken with the pyrometer, and it is sufficient to keep the temperature at the degree it has attained. If the proportion of carbonic acid gas is lower than 20 per cent., the generator is too hot, and the heating must be regulated so as to attain the proportion required. If a mixture of methane and hydrogen is to be prepared, the temperature must be lowered until the pyrometer shows a temperature that corresponds to the proper proportion of carbonic acid gas. In a generator fed with light coke, the proportion of 20 per cent. of carbonic acid corresponds to 970° read off the pyrometer. At 780°, 24 per cent. of carbonic acid is obtained and 12 per cent. of carbon monoxide. This mixture ought to yield about 33 per cent. of methane and 67 per cent. of hydrogen.

The water gas prepared in this manner is washed at D and cleaned at E, with a Laming mixture, before being deprived of carbonic acid.

When ordinary gas for lighting purposes and methane are to be prepared simultaneously, ordinary gas-works retorts may be used for generating water gas by introducing water vapour before the glowing coke is removed—such water vapour being afterwards transformed into methane.

II.—*Removal of the Carbonic Acid.*

The gas to be deprived of carbonic acid is passed in at the bottom of a vertical column F, down which a sodium carbonate solution flows. The liquid that runs out contains, of course, sodium bicarbonate, which is passed into boilers G, heated with the hot gases that come out of the water-gas furnace, by means of a pump K. In these boilers carbonic acid gas is given off. The production of carbonic acid gas by the decomposition of the bicarbonate may be facilitated by aspirating with a pump H. The liquid that finally contains the neutral carbonate only is brought back to the column F by pumps I; and the whole operation is started over again.

The carbonic acid gas cannot, however, be completely removed in this manner, owing to the fact that the sodium carbonate does not absorb the gas completely, because of the readiness with which the sodium bicarbonate breaks up, especially at the temperatures prevalent in summer. The removal of the carbonic acid is completed by passing the gas through a small column O in which a dilute solution of potassium or sodium hydrate is made to circulate, or else through chambers in which a layer of slaked lime is spread out.

If potassium hydrate is used, or sodium hydrate, the material is recuperated from time to time by heating it with lime. In the case of potassium hydrate, the resulting carbonate of lime retains a little potassium hydrate, and may subsequently be made use of in agriculture as a fertilizer.

The carbonic acid that escapes from the boilers G may be liquefied at J by compression in any known manner, and may be placed on the market as liquid carbonic acid.

III.—*Production of Methane in the Nickel Tubes.*

The practical method of carrying out this reaction depends on the following conditions: (1) The initial cleaning of the gas. (2) The arrangement of the apparatus. (3) The preparation of the nickel. (4) The way of conducting the operation.

(1) The gas, deprived of carbon dioxide at O, consists of a mixture of carbon monoxide and hydrogen. It must be freed from traces of sulphur compounds that it may contain; and for this purpose it is made to pass through tubes *e* containing copper in the shape of turnings or of a fine powder. These tubes are built into the water-gas furnace A B above the carbon tubes, and must be maintained at a temperature between 500° and 600° C. The copper, heated to dark red, withholds any impurities that might deteriorate the nickel. After long use, the copper becomes partly transformed into copper sulphide, and must be renewed. The copper sulphide may be submitted to a roasting process so as to obtain copper oxide, and the latter may be restored to metallic copper by treating the oxide with the gas to be purified.

(2) The apparatus for the production of methane consists of horizontal metallic flattened tubes *a*, into which flat receptacles containing nickel are introduced. These tubes are arranged in series in furnaces heated by the hot gases of the water-gas furnace. A cock *f* is provided between the steam-pipe *d* and the pipe connection of the tubes *a* for the admission of steam or water to the tubes, in order to clean them. Each tube may also be provided with a valve, so that each may be cleaned separately. Vertical cylinders may likewise be used that are supplied with horizontal plates on which the nickel is placed; the gases being made to circulate round these plates. The hot gases of the water-gas furnace are made to heat successively (after heating the carbon tubes *b*) the tubes *e* provided with copper, the tubes *a* or the horizontal plates for producing methane, and, finally, the boilers G for decomposing the sodium bicarbonate.

(3) The nickel producing the catalytic reaction must be in a powdered condition, and is obtained by reducing ordinary nickel oxide in the apparatus used for carrying out the present invention. The oxide is reduced by applying the mixture of carbon monoxide and hydrogen that issues from the copper tubes. The reduction ought to be effected between 350° and 450° C.

(4) The tubes (or flat cylinders) for the nickel are grouped in several series that are independent of one another, so that one series may be emptied, filled again, and reduced without interrupting the whole operation.

(5) The formation of methane is effected preferably at 350° C.; but the temperature may vary between 300° and 450° C. without involving serious disadvantage.

Coin Controlled Gas-Meters.

Stoneham, J. A. & F. A., Bickley, Kent.

No. 15,186; July 17, 1908.

This invention has for its object the provision of means whereby, when a given number of coins have been inserted into the meter, they can be exchanged for a coin of higher denomination, but equivalent value to the aggregate value of the coins released.

The patentees show, as an example, the type of coin-operated meter described in patent No. 25,272 of 1894 with which they have combined their invention to show its applicability to a gas-meter.

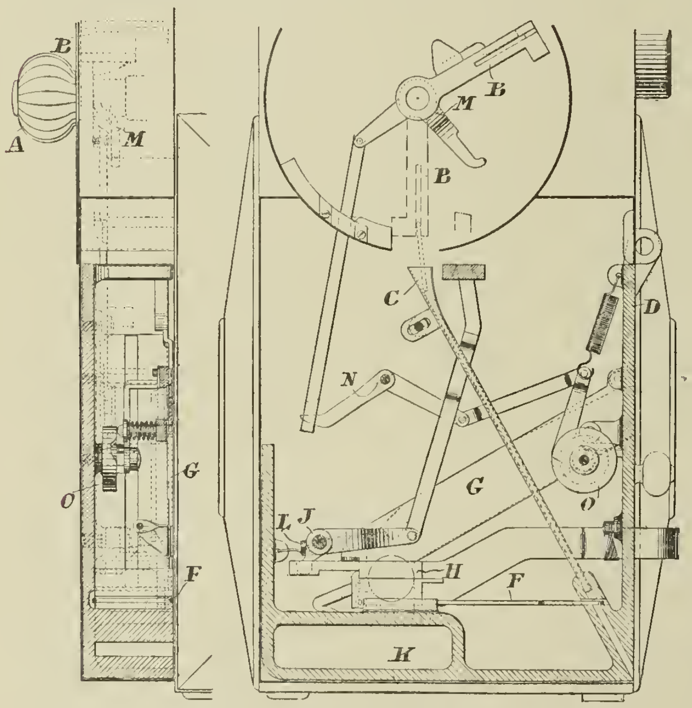
To the external handle A is fixed an ordinary coin-carrier B, which,

when carrying a coin and being turned into the vertical position (shown in dotted lines), delivers the coin into the coin-shoot C, disposed immediately beneath the carrier, and contained within the casing D, which is inserted into the space at the side of the meter provided for the coin-drawer, and secured therein by a padlock in the usual way.

The coin-shoot has a shutter adapted to close it and to collect the coins so that they are supported on one end at the edge; the distance between the shutter to the rotary carrier B being such that, when the sixth penny has been brought round by the carrier and dropped into the shoot, the fifth penny supports it at such a height as to lock the rotary carrier from movement in a reverse direction until such time as the shoot has been discharged of the six pennies collected in it.

In order to effect this purpose, a second shoot is arranged with its outer end open to the exterior of the meter, so that a coin of high denomination—say a sixpence—can be placed in it, which coin rolls down the inclined shoot into a carrier consisting of two parts, the upper part H provided with a handle outside the meter and a lower part to which the shutter F is attached. The lower part carries at its rearward portion a pivoted catch having an arm extending into the space inside the carrier, so as to come into the path of the coin in such a way that the weight of the coin operates the catch and releases it from engagement with a fixed stop. The sixpence then rests on the pivoted floor of the lower part. If the handle is now withdrawn, the part H of the carrier, by means of the sixpence, moves the shutter F until the opening formed in it coincides with the line of the shoot and allows the column of pennies to pass from the apparatus through the external orifice.

In order to lock the rotary carrier B from reverse motion, the part H has an extension which engages with the bell-crank lever J, to the lever arm of which is pivoted a rod sliding in the guiding bracket carried by the upper part of the casing D. When the bell-crank is in the position into which it is moved when the handle on H is pulled into its extreme outer position, the upper part of the rod shown in dotted lines comes into the path of the carrier B, and prevents it being rotated backwards into a position to receive a fresh coin.



Stoneham's Coin-Controlled Meter.

When the lower part of the sliding carrier reaches its extreme right-hand position, the pivoted floor swings round into the slot in the sixpenny till K and allows the coin to drop into the till. On the return motion of the lower handle to reinstate the mechanism ready for receiving another sixpence, the upper part of the carrier H abuts against the projection carried by the lower part and lifts the pivoted floor by the contact of the latter with the end of the slot. When this lower part reaches its extreme left-hand or rearward position, the catch automatically engages with the nose of the stop and prevents any movement of the shutter F until a further sixpence has been inserted in the coin slot; the spring L, attached at one end to the casing D and at the other end to the connecting pin, is adapted to retain the bell-crank in its two extreme positions.

In order to prevent a sixpence being placed in the sixpenny slot until six pennies have been inserted into the penny shoot C, there is loosely pivoted about the centre of the rotary carrier B, a bell-crank M, one arm of which is engaged by the penny when held in the rotary carrier B, while the other arm is attached to a rod, a bridle on which co-acts with one arm of the bell-crank N, the other arm being connected with a lever attached to a pin on which is pivoted a cam O. At the side of the sixpenny coin-shoot is provided a spring-pressed bolt, one end of which passes through a hole into the coin-shoot G, so as to form an obstruction to a sixpence when put in; the opposite end of the bolt engaging with the lateral face of the cam O in such a way that, when the end of the bolt trips into a recess on it, the sixpenny coin-shoot G is left without obstruction. But when the bolt is moved laterally in being pushed out of the recess, the end of it passes into, and forms an obstruction in, the shoot G.

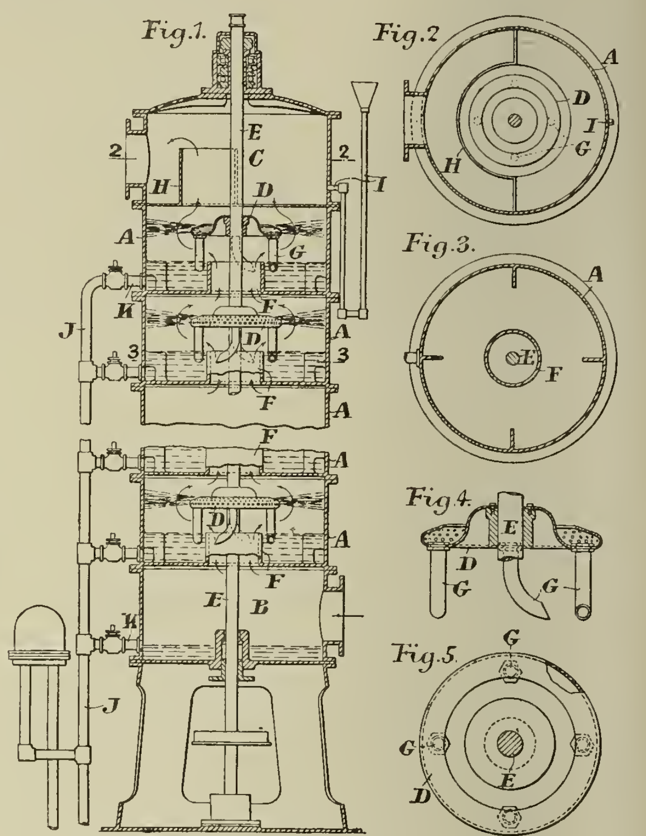
There are six teeth on the ratchet wheel; and as the lever is moved by the bell-crank N every time a penny is carried round by the rotary carrier B and dropped into the shoot C, it follows that the sixpenny shoot G is always obstructed, except when the last or sixth penny has been dropped into the shoot G.

Effecting Intimate Contact of Liquids and Gases.

Kirkham, Hulett, and Chandler, Limited, and Hersey, S., of Palace Chambers, Westminster, S.W., and Blake, E. W., of South Croydon.

No. 18,129; Aug. 28, 1908.

This invention is particularly designed for the extraction of ammonia and other impurities from coal gas by means of apparatus wherein the gas to be purified passes through a vessel in which the liquid is projected in the form of spray.



Kirkham, Hulett, and Chandler's Vertical Washer.

Fig. 1 is a sectional elevation of the apparatus. Fig. 2 is a section on the line 2. Fig. 3 is a section on the line 3. Fig. 4 is a vertical section of one of the spraying trays. Fig. 5 is a plan with a portion of the rim removed to show the interior of the tray.

A are superposed chambers, each of which is designed to partially wash gas passing through it. The lowermost chamber is mounted upon the chamber B, which is provided with the gas-inlet, and the uppermost chamber having mounted upon it the gas-outlet chamber C. D are the trays, one of which is mounted in each of the chambers A, and all of which are keyed upon the central shaft or spindle E, which is rotatably mounted in bearings top and bottom, and adapted to be rotated by a pulley from any source of power.

Each of the chambers A is provided at its bottom with a central upwardly extending tube or lip F, forming a central connection between the chamber and that immediately below it. Its height above the bottom of the chamber determines the depth of liquid which is normally retained within it, and it also serves as a passage for the gas to be cleansed from chamber to chamber.

Each tray is domed upwards at the centre, and provided at the periphery with perforations; the outer extremity of the periphery being inturned, so as to prevent the liquid being discharged over the edge of the tray. G are scoops depending from the underside of the tray between the domed portion and the perforations.

The outlet chamber C is provided with an upwardly projecting semicircular baffle H around an opening in the bottom of the chamber, which (in addition to serving as an outlet for the gas from the upper chamber) also serves for the introduction of the cleansing liquid through the inlet pipe I. J is the discharge pipe for the liquid—connected to each of the chambers A and to the chamber B by branch pipes K fitted with cocks.

Assuming that each of the chambers A has been supplied with a quantity of liquid, and that the shaft E is rotated, the trays D are caused to revolve, and the scoops G, depending from their lower side, pick up the liquid into which they dip and cause it to pass into the trays D—the scoops also acting as vanes. The centrifugal force generated by the rotation of the trays discharges the liquid through perforations or slots in the peripheries of the trays, so that it finds its way into the chambers in the form of spray, which comes into contact with the upflowing gas, then strikes the walls of the chambers, from which it rebounds, and thereby comes into repeated contact with the gases passed into the apparatus, and rise up successively through the chambers A—their upward flow being assisted by the exhausting action induced by the scoops depending from the trays D.

It will therefore be obvious that the gas which enters the lowermost chamber A passes successively upwards through the complete series of chambers; being subjected to repeated cleansing until it finally issues into the chamber C, and thence escapes in a properly cleansed condition. The washing liquid is run off through the discharge pipe K from the chamber B. Normally, the cocks of the chambers A are shut, and that of the chamber B open—the former cocks being for flushing purposes only.

Production of Water Gas.

Smith, H. E., of Victoria Street, Westminster.

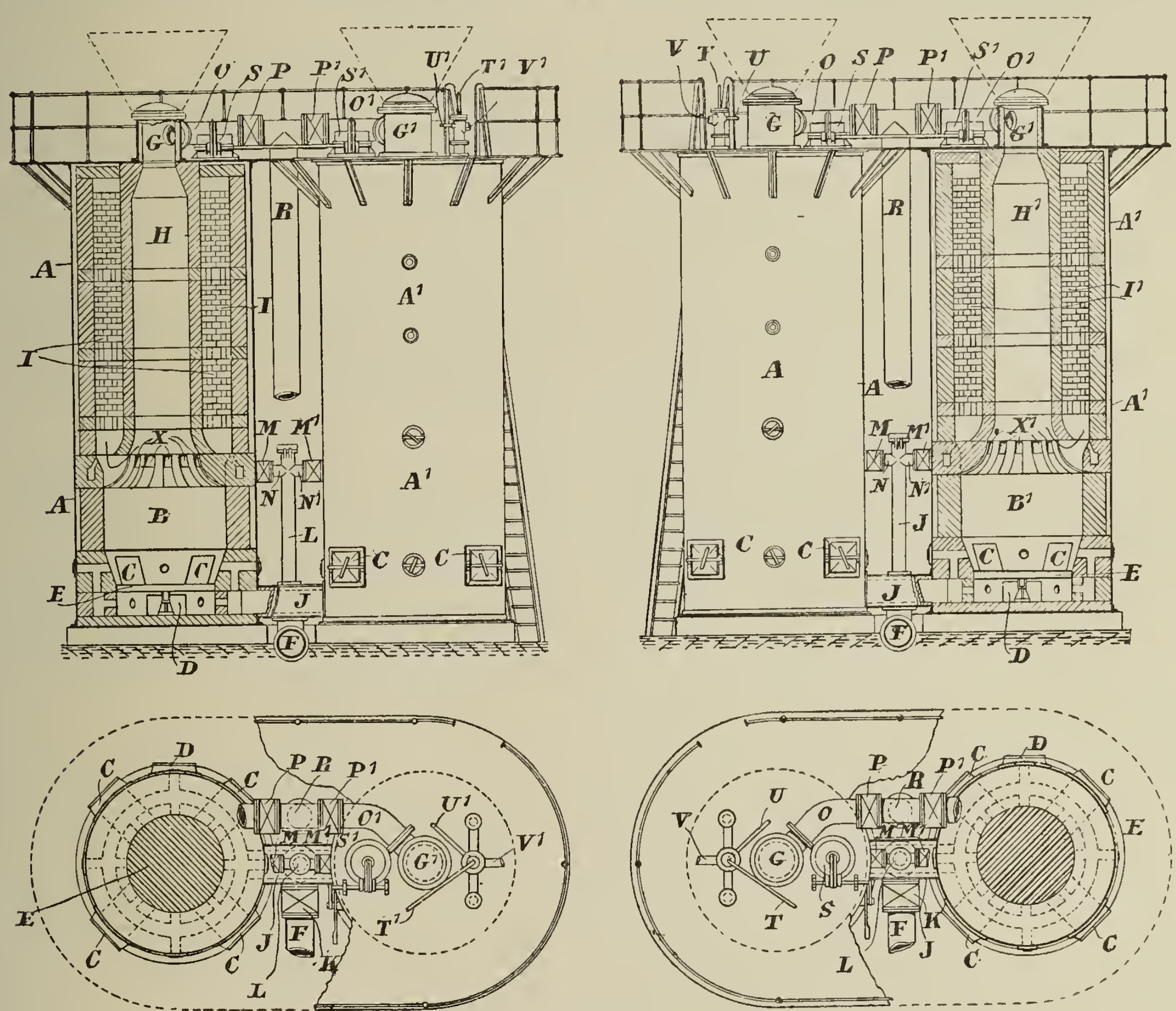
No. 24,893; Nov. 19, 1908.

This invention relates to apparatus for the production of water gas (either blue or carburetted) "in a most economical manner, by securing the utmost heat-efficiency from the fuel consumed in the apparatus." The principle of the arrangement is such that the heat produced during the "blow" is stored in two sets of suitably arranged baffle brickwork, and each of these chambers is used alternately as steam superheater and carburettor—the advantage of the arrangement being that any carbon deposit thrown down from the carburetting material in the carburettor during the "run" is highly heated during the "blow" following, and, in the next "run," the steam passing through in the opposite direction to that of the previous "run" converts the deposit into water gas; thus preventing any accumulation of solid matter in the checker brickwork, in addition to which the connecting and injection pipes are cleansed by the steam in its passage through them. A further feature of the system is the arrangement whereby a stream of gas is made to re-enter at the top of the carburettor, and thus ensure thorough circulation and blending of the gases.

The illustrations represent a part elevation and section, also a portion of the apparatus in plan and a section above the clinkering doors.

Two cylindrical fire-clay lined vessels A A¹ are placed side by side; and in the lower portion of each is formed a water-gas generator B B¹, fitted with clinkering doors C, ash-doors D, fire-bars E, and blast inlet pipe F—connection being made in the centre of the generator crown to charging hoppers G G¹, at the top of the steel vessel, by fire-clay channels H H¹. Above the crown of the generator chambers is arranged a system of checker brickwork I I¹, filling up the space between the charging passages and the outer lining of the shells. This brickwork is arranged so as to ensure uniform heat throughout and long travel of the hot gases, which enter from openings X X¹ formed in the outer circumference of the generator crown, at which points the secondary air supply is admitted. Between, and at the base of, the vessels A A¹, and opening into them, is arranged a fire-clay lined connecting pipe J, provided with a branch on which is fixed the primary-air valve K, and a vertical pipe L is carried up to give the secondary air supply to complete the combustion of the gases coming from the generator chambers B B¹ during the blow. Suitable valves, M M¹, are fixed in the secondary air supply pipes N N¹. At the side of each charging hopper G G¹, a branch O O¹ is formed, provided with valves P P¹, to control the gas-outlet between them and the main outlet T-piece R.

The fuel is fed in from the charging hoppers G G¹ to the full depth of cylinders; and both fires are raised simultaneously to a state of incandescence up to the level of the openings X X¹ leading from the generators B B¹ into the baffle brickwork chambers I I¹, by opening the main blast valve K and the secondary-air valves M M¹. The baffle brickwork chambers I I¹ are highly heated by the complete combustion



Smith's Water-Gas Generators.

of the gases, the products of which escape through the open stack-valves S S¹ at the top of the cylinders A A¹ and directly connected with the baffle brickwork chambers I I¹. When the generators and baffle brickwork chambers have attained a suitable temperature for gas-making, the blast is shut off by closing the valves K, M, and M¹. The two stack valves S S¹ are also closed. One of the gas-valves—say, P¹—is then opened, and steam is admitted through the pipe T to the superheating baffle brickwork chamber I in the other cylinder A, and the carburetting material is admitted by a pipe U¹ to the carburetting baffle brickwork chamber I¹, together with a stream of gas introduced through the pipe V¹, which gas is re-passed from the outlet main or any convenient source. The steam, on admission, travels through the baffle brickwork chamber I, and is highly superheated thereby; while any carbon deposited from previous carburation is converted into water gas, which is carried with the steam to the fire in the generator B, down which they travel—the steam being utilized for the production of water gas according to the usual reaction. The resultant gases now pass through the fire-clay lined connecting pipe J and up through the fire in the generator B¹; the long travel reducing the amount of carbon dioxide present. At the crown of the fire of the generator B¹, the hot water gas comes into contact with the gas generated from the carburetting material together with the circulating stream of gas, both of which have travelled down the carburetting chamber I¹. The resultant carburetted water gas passes away up the connecting chamber H¹ between the feeding hopper and the generator, and through the branch pipe O¹ attached to the side of the charging hopper G¹; thence through the open gas-valve P¹ to the usual condenser and scrubber.

When the test-flame shows indications that the heats are getting low, the oil and circulating gas-valves attached to the pipes U¹ V¹ are closed; the steam supply T is closed; and, finally, the gas-valve P¹ is shut. The stack-valves S S¹ are then opened, and fires are again raised to a suitable state of incandescence by opening the blast-valves K, M, M¹. These valves are then closed, and the stack-valves S S¹ are also closed, and the sequence of operations for the next run is reversed. The gas-valve P is then opened, steam is admitted through the pipe T¹ to the superheating baffle brickwork chamber I¹ in the other vessel A¹, and the carburetting material is admitted by the pipe U to the carburetting baffle brickwork chamber I, together with a stream of gas introduced through the pipe V, which gas re-passes from the outlet main or any convenient source. The steam on admission travels through the baffle brickwork chamber I¹, and is highly superheated thereby; while any carbon deposited from previous carburation is converted into water gas, which is carried with the steam to the fire in the generator B¹, down which they travel—the steam being utilized for the production of water gas as before. The resultant gases now pass through the fire-clay connecting pipe J and up through the fire in the generator B. At the crown of the fire in the generator B, the hot water gas comes into contact with the gas generated from the carburetting material together with the circulating stream of gas, both of which have travelled down the carburetting chamber I; and the

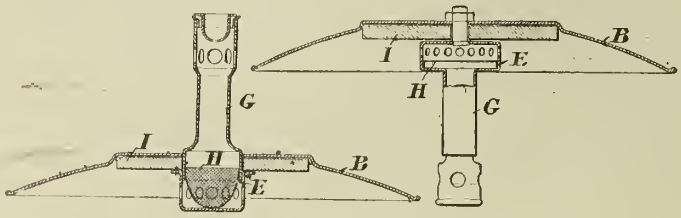
resultant carburetted water gas passes away up the connecting chamber H and through the branch pipe O attached to the side of the charging hopper G; thence through the open valve P to the usual scrubber and condenser. Gas making is continued until a further blow is necessary, when the sequence of operations is again reversed.

Gas-Bracket Radiators.

Brandt, M., of Berlin.

No. 10; Jan. 1, 1909.

This device is shown as a suspended and as an upright heater. It consists of a mushroom-shaped reflector B made of sheet-metal, with a disc I of refractory material in a cavity in the centre of it. It is fixed to the burner-tube G. In the inverted arrangement, the disc is maintained directly by the burner-head E, which has a wire gauze H in it,



Brandt's Gas-Bracket Heat-Radiators.

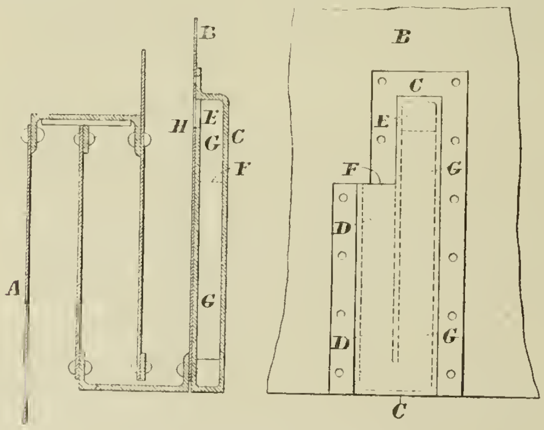
serving to prevent the back-lighting of the flame. The burner-head in the upright type has its tube G fixed upon the air-nozzle. When in use, the flame strikes against the refractory disc I "upon which the hot gases are uniformly divided, to flow off along the inner surface of the reflector."

Gasholder Water Lutes.

Wright, H. F. (C. & W. Walker, Limited), of Donnington, near Newport, Salop.

No. 9485; April 21, 1909.

This invention relates to means whereby water from the lutes or seals of the lifts of gasholders is prevented from passing down the exterior of the lifts and disfiguring them, or causing ice to be formed thereon. It has been proposed to make the rim forming the cup round the edge of the lift and entering the inverted cup around the lift below it below the level of the base of the inverted cup, or else perforated, so as to enable the water in the lute to balance the gas pressure, so that a water-seal is maintained, but, when water is added to the lute, an equivalent amount will be discharged internally over the edge of, or through the perforations in, the rim. This construction requires either an increase of material in the cups or else a reduced seal; and it is the object of the present invention to provide an arrangement by which these objections are overcome.



Wright's Gasholder Water Lute.

The illustration represents, in section, the water-seal portions of two lifts, and an inside view of part of a lift with the improved overflow applied.

The lower lift A and the upper lift B are provided with the usual water-lute cup and inverted cup. To the inner side of the upper lift of any two lifts is affixed a casting or casing C, formed with a longer channel E, and a shorter channel D; these channels being separated by a partition which leaves, at the bottom, a passage forming a communication between the lower ends of the channels. The top of the channel G has an opening in it, above the level at which water is to be retained in the water-seal before cupping, and coincides with an opening in the lift B. The top of the shorter channel D is open (at a lower level than the opening E) at F, to allow overflow water to pass into the tank of the holder.

The German Lamp Taxes.—The taxes on gas and electric lamps have now passed through all their stages, and will come into operation on the 1st of October. The annual yield to the State Treasury is expected to amount to £1,000,000. The introduction of the tax at the date named will result in an increase in prices to the public. Carbon filament lamps up to 15 watts will be sold at 1s. 9·6d. each, compared with 1s. 9d. at present; metallic filament lamps up to 15 watts, which have hitherto been available at 2s. each, will cost 2s. 1·2d.; and incandescent gas-mantles will be sold at 4·2d. apiece instead of 3d.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Mr. Forshaw's Paper on the Luminosity of Gas-Mantles.

Sir,—I have read with very much interest your "Journal" for June 22, containing the report by Mr. Forshaw on the luminosity of gas-mantles, together with the discussion thereon. A later paper of mine, by myself and Traver, on the theory of the incandescent gas-mantle, shows that we believe that the temperature of the mantle is the most important factor in causing its illumination. Our work with commercial gas-burners, however, shows that the illumination follows quite closely the heat-value of the gas.

I am rather compelled to believe, from the fact that the theoretical combustion temperatures of carbon monoxide and hydrogen are so closely the same, that if a mantle and burner could be made which would work with equal efficiency on the two gases, the results would be more nearly the same than are shown in Mr. Forshaw's work.

Chemical Laboratory, University of Michigan, Ann Arbor, July 19, 1909.

Alfred A. White, Junior Professor of Chemical Engineering.

Discussion on Mr. Waddell's Paper—A Correction.

Sir,—I desire to correct a misreport in your issue of the 3rd inst. You report the writer as having said: "This was an entirely different system from that used at Dunfermline by Mr. Waddell, inasmuch as Mr. Waddell employed continuous high pressure." What I said was: "The system used in Dunfermline by Mr. Waddell differs somewhat from the system used by us in Lochgelly, inasmuch as we carry a much higher continuous pressure."

The high continuous pressure is just what Mr. Waddell tries to avoid, and instead to carry only a pressure equal to the demands of the moment. I think he has achieved this very successfully.

Lochgelly, Aug. 4, 1909.

James D. Keillor.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill brought from the Commons, read the first time, and referred to the Examiners: Bury Corporation Bill.

Bills reported, with amendments: Cardiff Corporation Bill, Heywood Corporation Bill, Prestatyn Urban District Council Bill.

Bills read the third time and passed: Gaslight and Coke Company Bill, Heywood Corporation Bill, Llanelly Water Bill, Mountain Ash Urban District Council Bill, Northallerton Water Bill, Oldham Corporation Bill, Prestatyn Urban District Council Bill, Watford Urban District Council Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill reported, with amendments: Risca Urban District Counci Bill [Lords].

Bills read the third time and passed: Bury Corporation Bill, Stourbridge and District Water Board Bill [Lords].

Large Leakage at Oswaldtwistle.—At the meeting of the Oswaldtwistle District Council last Thursday, the monthly report of the Gas Manager (Mr. J. H. Davies) contained figures showing that during five years the gas sent out from the works for the June quarter has increased by 53 per cent., which is abnormal. Referring to this matter, he said: "My only fear is that a larger percentage of this is going in leakage this year than in previous years, on account of the increased pressure (necessary to supply the consumers, owing to inadequate service-pipes) to be carried on the district."

The Coal Mines (Eight Hours) Act.—In the House of Lords last Thursday, the Lord Chancellor, in answer to a question put by Lord Newton, said it was the intention of the Government to introduce at an early date a small measure to amend the above-named Act. It was designed to meet the difficulties which had arisen under the operation of the original Act with regard to the time of beginning work. It was understood to have the general assent of employers and employed, so far as opinion on the subject had been expressed. It was hoped that, after all, it would prove to be a non-contentious measure, and that it would enjoy a happy passage through both Houses of Parliament.

Electric Light Profits and Losses.—The Lighting Committee of the Tunbridge Wells Corporation reported last week that the borough electricity undertaking, with an outlay of about £80,500 on plant, and working for fourteen years, had produced a clear profit of £59,327 to lessen the burden of rates, and in spite of the competition of gas. On the other hand, it transpired in the course of an inquiry by Mr. H. R. Hooper into an application by the Epsom Urban District Council to the Local Government Board for sanction to a loan of £1500 for electric lighting purposes, that there had been a total loss of £7122, and that the Council had been going on year after year incurring a steady annual loss of £900 with perfect equanimity. Mr. Hooper said there had been a loss on both private and public lighting, and the Council had been carrying on a system of lighting without knowing the cost of it.

THE GASLIGHT AND COKE COMPANY.

The One Hundred and Ninety-Fifth Half-Yearly Ordinary General Meeting of the Proprietors was held last Friday at the Chief Office, Horseferry Road, Westminster—Mr. Corbet Woodall (the Governor) in the chair.

The Secretary (Mr. H. Rayner) having read the notice convening the meeting, and the seal of the Company having been affixed to the register of proprietors, the report (which was given in the "Journal" last week) was taken as read.

A DIRECTORATE LOSS.

The Governor: Ladies and Gentlemen, I cannot proceed with the ordinary business of the meeting without first referring to the alteration in the constitution of the Board since we last met. Mr. Howard Charles Ward is no longer with us. He was for 45 years a Director of the Company, and during half that period its Deputy-Governor. He was a kindly and courteous gentleman and, as I can speak from grateful recollection of my association with him, a most loyal colleague. He gave of his best to the service of the Company, his connection with which he was proud of. Although he has left us, as I think all of us would like to leave, full of years and held in honourable remembrance, we all on this side of the table are very sorry to lose him. I beg to propose—"That the shareholders assembled here to-day tender to the relatives and the family of the late Mr. Ward their condolence with them, and their appreciation of the services which he rendered to us." [The resolution was carried.]

REPORT AND ACCOUNTS.

Both the report and the accounts are of more than usual interest. The accounts call for, and they deserve, attention in detail, both for what they tell of the past and because of the assistance they afford when considering the future. The most urgent need of the Company, and the aim we all have in view, is to enlarge the demand for gas, and, as a means to this end, to reduce its price. If this policy is to be successful, it should be consistent. Reductions once made must be maintained; there must be no turning back to higher prices, except under circumstances which are plainly irresistible. At the same time, having regard to the moderation of our standard price and to the new condition under which each lowering of price brings, not only gain to the consumers, but additional income to the employees, it is reasonable that the shareholders should receive the full dividend to which they are entitled. On the occasion when I first occupied this chair, three-and-a-half years ago, a remonstrance was made by shareholders against the payment of a dividend of £4 8s. per cent., on the ground that it had not been earned in the half year, and that the financial position of the Company needed strengthening. Since then, the price of our gas has been twice reduced; and we are under promise to lower it again on Jan. 1 next. We have at the same time raised the dividend to £4 10s. 8d.; and we now recommend a further increase to £4 13s. 4d. per cent. These engagements are onerous; but I hope to satisfy you that they have not been rashly undertaken. Now, let us look at the accounts before you. The reduction of price which came into effect at the commencement of the half year, involved a loss in revenue of, in round figures, £40,000. The accounts show not £40,000, but £29,000 only; the difference being due to an increase in the quantity of gas sold, which brought in £11,000. Residual products have realized £406,000, or £93,000 less than in the corresponding period of 1908. Of this great sum, £84,000 is due to the diminished value of coke and breeze. As will be seen from the revenue account, the gross income of the half year has been less by £113,000. On the other hand, the cost of manufacture has been reduced by £99,000, of which £79,000 comes from cheaper coal, and the rest from further savings on working charges. The coal used has been less by 46,000 tons than it was in the corresponding half year; about half (23,000 tons) of this being due to improved carbonizing, and the remainder to a small increase in the percentage of oil gas made. It is a coincidence that the loss on coke almost exactly balances the saving in the cost of coal. I need not refer to any other item in the accounts, except one which appears for the first time—viz., that of £11,605, the contribution for the half year made to the employees under the co-partnership scheme. The balance at the credit of the revenue account is £572,000, or £49,000 less than in the corresponding period. Bringing in the amount carried forward from the last account, and deducting fixed capital charges and the sum specially provided for launching the co-partnership scheme (£27,078), we have available for distribution £773,196, or £7211 more than at this time last year. The Directors recommend a dividend at the rate of £4 13s. 4d., or 2s. 8d. per cent. more than last year. This will require £353,302. Adding £10,000, the contribution for the half year to the redemption fund, we have a total of £363,302. This, deducted from the sum available, leaves a balance to be carried forward of £409,893, or only £2405 less than at June, 1908. If the comparison is made with the balance at Christmas last, the reduction is £13,431. It will be borne in mind by the shareholders that the reduction in price next year will not be accompanied by an increase of dividend. The lowering of the standard price from 3s. 3d. to 3s. 2d. (to which I shall refer later) makes £4 13s. 4d. per cent.—the maximum to which we are entitled when the charge for gas is at 2s. 8d. per 1000 cubic feet. The expenditure on capital account has amounted to £45,213, and has been, as usual, practically all on distributing pipes, meters, and stoves. As the depreciations, coupled with a small sum received for land sold, amount to £47,868, the capital employed shows a slight reduction. The profit of the half year (£572,600) has been sufficient to meet all charges, pay the increased dividend and the statutory contribution to the redemption fund, and leave a margin of £13,500. By the payment of the special bonus of £27,000 to the employees under our co-partnership plan—a payment which is exceptional and will not be repeated—the actual sum carried forward is reduced by about £13,500. Before we meet again, the price of gas will have been, as I have already said, further reduced from 2s. 9d. to 2s. 8d. per 1000 cubic feet, and there will be considerable abatements in the charge for public lighting and in the price in the district south of the Thames. These, together, will further reduce the revenue by about £100,000 per annum. I think, however, that this shrinkage of revenue will be balanced by diminished expenditure, and that there will be little (if any) need to draw upon the large sum of undivided profit which has been accumulated. The cost of coal and oil will be better on the year by a sum considerably larger than we can possibly lose on the price of residuals. I may say that the cost of coal and oil will be at least £100,000 less than if the prices of the past half year had been maintained; and this of itself would balance the reduced price to which I have referred. But we are not yet sure what will be the price of residuals. It will be less than last year; but to what extent we cannot yet say. The reduction in the illuminating power of the gas from 16 to 14 candles which will be effected on the passing of our Act, will bring with it further economies; while the additional gas sold in the West Ham district will be made at less cost and will yield a larger margin of profit. Taking our circumstances as a whole into consideration, we are fully content with our prospects at the lower price.

CO-PARTNERSHIP.

This scheme is now fully launched. More than 8500 employees have been enrolled; and the charge involved has been £38,683. The yearly charge, at the present price of gas, will be about £24,000; and the reduction which is to take effect next January will add to the amount some £4000. When the employees of the West Ham Company are included, the amount will be further increased by from 8 to 10 per cent. Of the large sum appearing in the accounts under this head for the half year, £27,000, is (as I think I have already mentioned) a special bonus not to be repeated. Including this, the average amount at the credit of the members is £4 10s. 11d. There are 1284 officers and men who have received five guineas or over, and will be promptly enrolled as stockholders. We look forward with confidence to the future of this endeavour. We hope that it will tend to perpetuate and improve the good relations already existing between the employees and the Company, and we expect that it will raise the average of zeal and efficiency and tend to eliminate distrust and friction. The affairs of the co-partnership will be managed by a General Committee, representative of all departments of the service; and this Committee will form a link between employers and employed, which will be of great value. The whole gas supply of London—an organization second only to the Railways in respect of the number of men on its pay-sheets—is now based upon the co-partnership principle. I trust our experience may be such as to encourage its further and wide extension.

EDUCATIONAL.

The activity in regard to applications of gas to the service of the community, to which I have made more than one reference, continues. Gas lighting and heating appliances are occupying the attention of inventors as conspicuously and successfully as at any earlier period. Apparatus grows more complex as well as more efficient and popular; and the task of the employees in keeping abreast of this activity, and fitting themselves to apply it in the public interest, more arduous. The system of technical instruction embarked upon three years ago has been of great service to the outdoor staff, and has helped materially to make them capable and trusted advisers to the consumers. Not only are the Directors satisfied, on the evidence furnished by the present year's staff examinations, that the system is bearing good fruit, but the successes of numbers of the staff in the independent City and Guilds of London examinations also prove its merit. The shops which were opened at this station last year for the training of youths direct from the London County Council Schools as gas-fitters have proved successful and nearly self-supporting. The first batch of boys have finished their six months' preparation in the shops, and a second lot of a very promising appearance will enter next week. We are confident that this method of recruiting will be fruitful of good to the Company and to the boys.

THE RETIREMENT OF MR. FOULGER—HIS SUCCESSOR.

Mr. Foulger, who for some twenty years directed the distributing staff of the Company, has, because of the circumstances I referred to six months ago, resigned his appointment; and his resignation, after a total service of 44 years, has been accepted with regret by the Directors. The vacant office has been filled by the appointment of Mr. H. S. Reeson, who had acted as Chief Assistant for eleven years. He is a son of Mr. Joseph Reeson, who was for nearly forty-two years in the service of the Company (a part of the time as Registrar and part as Assistant-Secretary and Registrar), and who retired in 1901. He is a brother to Mr. J. N. Reeson, the very able Engineer-in-Charge of our Beckton works. The new Chief Officer will, we believe, prove all that his training and associations justify us in expecting.

BILL IN PARLIAMENT.

The most interesting event of the half year has been the passing through Parliament of the Act by which the undertaking of the West Ham Gas Company is incorporated with the Gaslight and Coke Company. As the result of negotiations prior to the introduction of the Bill to the Committee, all opposition except that of the West Ham Corporation was withdrawn. The London County Council and the Corporation of the City asked that the standard price should be reduced by 2d., as consideration for their agreement to the reduction of the minimum illuminating power from 16 to 14 candles. This was the price paid by the other Metropolitan Companies for the same alteration; but, as the saving in cost of manufacture could not amount to nearly so much as the authorities named, we compromised for a reduction of 1d. Needless to say, we strove hard against any change; but we preferred to make this sacrifice rather than engage in a strenuous and possibly bitter fight against Municipalities with whom it is our desire, and also the interest of the Company, to maintain friendly relations. We have agreed also that our gas shall in future be tested for its heating as well as its lighting value. So large a proportion of the gas we supply is now used for purposes where heat only is required, that the call for a calorific test is reasonable. The standard of the test is such that we have little fear that under it we shall be called upon for penalties.

THE LABOUR OPPOSITION TO THE BILL.

The opposition to the Bill by the West Ham Corporation was directed largely—I might almost say wholly—to the continuance of the manufacture in West Ham and to the employment of a maximum number of workmen. We gave a pledge early in the negotiations to keep the works at West Ham open for a period of ten years, and to manufacture there substantially the same quantity of gas as prior to the amalgamation. It was desired by the Corporation that we should undertake further to employ the same number of men. One of the chief arguments for the Bill was that the Gaslight and Coke Company can manufacture gas at a lower cost than is possible at West Ham; and the undertaking asked for would, if granted, have nullified this advantage. In other words, we were asked to pledge ourselves to carry on our manufacture extravagantly in order that places might be found for a larger number of men. We have no desire to reduce the number of men. Our effort is, and will be, to increase the output of gas; and to this end it is essential that we reduce the price. To keep up the price is to limit the business; and the workers would feel the injurious effect at least as severely as the investors. No industry and no department of an industry can, without grievous loss, be legislated for on the lines suggested. As an illustration from this Company's experience, the cost of carbonizing has been reduced by the introduction of machinery; but the total number of men employed was greater last Christmas than in the year before. The development of the business in stoves and fittings has involved the employment of a very large contingent of men as fitters, repairers, &c.; and behind these is the much greater number engaged in the manufacture of appliances. Legislative intrusion, such as that sought, would inevitably result in evil and not good to the class which it was intended to benefit; and the voices of the workmen generally—especially those who are co-partners—would certainly be raised against it. The wages and salaries paid by the Gaslight and Coke Company now total to £968,000 per annum; and the conditions of service are in my opinion equal to the very best in London.

THE BILL PASSED.

I am very glad to say that the Bill, with the amendments of the House of Lords, was reported to the House of Commons yesterday and passed; and it now only awaits the Royal Assent. I hope we shall be found working on as good terms with the Corporation of West Ham as is happily the case with us and the other Municipalities of London. With these observations, I beg leave to move—"That this meeting do agree with, and confirm, the report of the Directors and the Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 29th ult."

Mr. Ulick J. Burke (Deputy-Governor): I have great pleasure in seconding the motion.

Remarks by Shareholders.

Mr. E. Kimber said, before the motion was put to the meeting, he should like to make a few remarks. He noticed that in No. 14 account the store of coal in hand on June 30 was 83,000 tons. He did not know what was in store on July 31; but it was fair to assume that the same quantity was in store at that date. It was material for the shareholders to know this, because July 31 was a very serious and important date for everyone engaged in the gas industry to consider. July 31 was the date on which a universal coal strike was predicted as being probable in this country. Had the strike taken place, it would have had most disastrous consequences, not only to this Company, but to every other company and all like industries throughout the country. Assuming these 83,000 tons to represent the stock in hand on July 31, 83,000 tons was only just 2 weeks and 4 days' supply for them. It had been calculated that, had a strike taken place, it would have lasted three or four weeks. The result would have been startling, because the Company's stock of coal would have been exhausted; and, as everyone would admit, this would have been a lamentable state of affairs. Now, how could they meet this possibility? He was very glad to see there was one gleam of light shown by the report, and that was that, in addition to the quantity of coal actually employed, 7,723,000 gallons of oil were used.

The Governor: You are wrong as to the 83,000 tons. The quantity of coal in store on June 30 was 119,000 tons.

Mr. Kimber said that was not much more. It only gave them a little over three weeks' supply, instead of 2½ weeks'. But supposing it was 119,000 tons, it was only a proportion of what the Company used in the half year. He noticed that they used 849,875 tons in the six months; and where this quantity would have been obtained had there been a strike, it was impossible to conceive. He thought the time had now come when all gas shareholders should look out for a different source of supply. There was, he knew, another source of supply to be found, and that was in Nova Scotia. It had been stated that coal could be put on board for 5s. 3d. per ton, and brought to this country for 5s. per ton. This would give them coal at 10s. 3d. per ton in the Thames. Coal at present cost them 13s. 8d. per ton, and the South Metropolitan Company 12s. 10d. per ton. This was a difference of only 10d. per ton —a price far beyond the price at which Nova Scotia coal could be delivered here. The quality of the Nova Scotia coal would have to be investigated; but, from all he could ascertain, it was a good gas coal. Although the Company could not investigate the coal, it was high time the shareholders should take up the question for the purpose of serving their own interests. It was absurd for a large body of shareholders throughout the country to lie quiescent when they had, he would not say a thief, but an enemy at their doors, who would, without the slightest compunction, deal out death and destruction to all industry. It was quite clear that the doctrines which had been propagated by Trade Unionists should be laid before a proprietary like that, in order that their true value should be assessed. They were most dangerous to all industrial societies, and some stand should be made against them. Everyone must see that the Trade Unions of this country had got absolute control of extreme politicians; and the sooner this was done away with the better.

Mr. W. A. Hounsom did not think that the meeting should separate without a word being said from their side of the table as to the report and the speech of the Governor to which they had all listened with so much interest. First of all, he would like to endorse the words spoken with regard to the loss of the late Mr. Ward, and his long and honourable connection with the Company. Some of them had been associated with him for many years; and they much appreciated his great abilities. He hoped he might not be out of order in saying that he thought the shareholders would welcome Mr. Godlee, who came in connection with the West Ham Company. He (Mr. Hounsom) had watched the parliamentary struggle the last few months with much interest; and it was a subject of great gratification to him that the result had been so successfully achieved. It seemed the exemplification of the old adage that there was no rose without a thorn. But there was something even deeper than that on which they had to congratulate themselves, more especially the Board and those who surrounded them on the platform; and that was that it was now possible for the Company to so successfully prosecute a Bill in Parliament having such far reaching results as had the West Ham Bill. Going back but a few years, he ventured to say that it would have been impracticable for such a Bill to have become an Act; and it was indeed a happy augury of what they might look forward to in the future. This amalgamation would be of the utmost advantage to the Company and also to the interests of West Ham—all those who consumed gas and all those who made gas. There was one other topic to which he might allude, and that was the new standard of calorific power. He was glad the Company had had to take this matter up, because, although they would be very glad to be free from these standards, tests, and so forth, they must still recognize that, having a monopoly, something of the kind was needful. Perhaps in a few years' time the candle-power test would be a thing of the past. In connection with this, he might say that those who in the olden days turned their attention to the incandescent mantle would see the great progress which had been made in connection with this. The incandescent mantle had for its first object the increase of light. This had the indirect effect of turning attention to the burner; and the effect of the burner and the mantle together had produced the wonderful result they saw to-day. This had led to increased attention being given to the heating power of gas, which had been of the utmost advantage to all parties, because it had given opportunities for the development and the use of gas for heating and industrial purposes. He thought they should give every encouragement to those endeavouring to perfect heating appliances. The sooner they got a good stove suitable for ordinary domestic purposes of to-day, and economical, the better. He was very glad to see that the Technical Journals had taken up the question; and he trusted it might be the good fortune of some of those in that Company, or their employees who were so deeply interested with them as co-partners, or some of those in the chief offices of the Company, to invent a good and efficient stove. Of course, one could not get over the fact that an Englishman did like a poker to knock the coal with to bring a blaze; but if they could satisfy him in another way, he would do without the poker.

Mr. H. H. S. Croft said he thought it ought to be made quite clear that the increased dividend was not at the expense of any provision for the protection of the Company. On looking at the accounts, he noticed that nothing was carried this half year to the insurance fund; and, turning to Account No. 9, he saw that they carried to the insurance fund "interest on the amount invested, £1602." But nothing was put down in the revenue account separately as having been carried to the insurance fund. He did not know whether, under ordinary circumstances, had the increased dividend not been paid, the sum would have been placed to the credit of the insurance fund.

Mr. C. E. Jones said he was reluctant to take up the time of the meeting; but, as they on that side of the table had been somewhat critical, he thought that, as the wheel turned round, the shareholders should have a word of praise for the Board. He had been asked by some friends in the Provinces to express his views on the balance-sheet; and he could only say that it was very satisfactory, very hopeful, and gave great encouragement to them as to the future. He thought the Board should be congratulated for the policy they had pursued in the past; and he hoped it would be continued in the future. As one who had known the late Mr. Ward for over 40 years—having known him at Portsea as well as in the Metropolitan area—he should like to say that he deeply regretted his removal; and the sympathy of those he had left behind was very deep. He felt sure he echoed the sentiment of those on his side of the table when he expressed his hearty sympathy with the Board in the loss they had sustained. He also congratulated Mr. Burke on his appointment; and he hoped that, with his undoubted ability, he would long live to occupy the position he now held. With regard to the coal trade, he said there was a great deal of sentimentality about the winning of coal. The Victorian era was very full of sympathy, but a great deal of it was misplaced. He hoped the sympathy of the Board with coal winners would not lead them into the error of thinking they would get any concessions from Trade Unions. But, where and how were they going to alter the state of things existing to-day when the power of Parliament was wielded through Trades Unions? He knew something about the getting of coal; and there was more danger in the streets of London than there ever was in the coal pits of this country. There was a whole army of men looking after the miner's safety; and the coal mine owners themselves were most anxious for it, and to do their best for their employees. In London alone, there were over 8000 people killed every year, and something like the same number injured; while accidents in mines were few and far between. Directly there was one, however, a wave of sympathy passed over the hearts of the people in this country, who handsomely subscribed to relieve the poor and needy in such circumstances. But, as a matter of fact, most collieries had sick and accident funds of their own. He did not for one moment wish to stem the tide of charity; but he really thought a great deal of it was misapplied. The most important announcement in the report to his mind was paragraph 5; and he heartily congratulated the Board upon the very important acquisition they had recently made to the Company's position. He also congratulated the Chairman of the West Ham Company on having a seat on the other side of the table, with the very excellent Board and their equally excellent staff. From a service point of view, West Ham was a capital place to live in. He remembered in the sixties efforts were made to remove gas industries and others entirely out of London. A great cry went up that they were poisoning the people, that they were monopolists, and ought to be exterminated or banished from this island to the place where "the wicked cease from troubling and the

weary are at rest." Now-a-days, West Ham opposed the removal of the gas-works from their district, because a great change had come o'er the spirit of the dream, and because it had been found that gas companies, like railway companies, were the largest ratepayers. He would not have given an undertaking to remain ten years. But it having been given, he had not the slightest doubt it would be loyally carried out for the benefit of West Ham. For Mr. Foulger's accident, all the shareholders grieved; but they felt that the Board had acted very wisely in appointing Mr. Reeson in his place. He heartily approved the statement of accounts. He wished the Company every prosperity, and congratulated the shareholders on the excellent position that their undertaking was in.

Mr. E. Kimber said he did not represent capitalists, but simply Trustees of charities who were stockholders in the Company to the extent of £20,000.

Reply by the Governor.

The Governor: I have to apologize for a great omission, of which I have been reminded by Mr. Hounsom and Mr. Jones. I omitted to tell you that the vacancy on the Board so sadly made has been filled by the election of Mr. Joseph Lister Godlee, the Chairman of the West Ham Company. This anticipates by a few months an election that would in any case have taken place in January. Under the provisions of the Act just passed, we are required—a condition we willingly accepted—to add a Director of the West Ham Company to this Board; and it has been arranged that the election should be ante-dated. So that Mr. Godlee is with us to-day. We have also been extremely glad that we have been able to bring into the deputy chair one who is so entirely acceptable to the Board as is Mr. Ulick Burke. [Hear, hear.] The interesting observations made to us by the first speaker were a little marred by inaccuracy as to fact; but there is no doubt about the wisdom of seeking other fields from which to supply the great fuel needs of the Company. When Nova Scotia has suitable coal for sale, we shall be glad to hear more of it. Instead of 2½ weeks' supply, we had at the time the shareholder referred to something like seven or eight weeks' supply of coal, as well as other materials for gas making, on the premises; and we are usually able to look forward without anxiety to three months' suspension of supplies. The purchases we have made now extend, as to some portion of our materials, to June, 1911; and they have been made on satisfactory terms. With regard to coal, the savings we shall effect in the current year are large. The position of the Company is one of security with regard to a strike of any probable duration. We are always pleased to hear Mr. Hounsom upon the affairs of the Company; and we are glad indeed to have his approval of the terms of the Bill which will shortly become an Act. The result of it will be a widening of the sphere of our operations by bringing in an area in which there is a much greater prospect of increase than there is in the built-up area of London. This will add materially to our own success by bringing into profitable use plant now lying idle, and it will advantage the consumers by saving the expenditure of a very large sum of money, which would have meant simply duplication and waste. With regard to the insurance fund, we have not carried anything to the fund this half year. We are quite satisfied with the amount standing to the credit of the fund at the present time. Last June, we put £10,000 to it, mainly because it had been depleted to a certain extent by an exceptional and a regretted explosion which led to considerable expense. I can hardly allow the observations with regard to Trade Unions to pass as expressing the view of the shareholders of this Company. There is no doubt whatever that Unions of employees have been to their advantage in many respects. Of course, we all deplore the uses that have been made of these organizations in some cases; but the union of men in all trades for the protection of their own interests is, I think, one that is desirable in the common interest. I am always glad to see a Trade Union well managed and conducted, as I think it is a security for peace.

The resolution was put to the meeting and carried unanimously.

Dividends.

The Secretary then read the minute of the Court of Directors as to the dividends, viz.:—

Resolved, that it be recommended to the half-yearly ordinary general meeting of proprietors to be held on the 6th prox.:
(1) That the sum of £10,000 be set aside out of the divisible profits of the Company for the half year ending on the 30th day of June last towards the redemption fund, in accordance with the provisions of the Company's Act of 1903, and
(2) That a dividend as follows for such half year be declared, subject to deduction of income-tax—
On the 4 per cent. consolidated preference stock at the rate of £4 per cent. per annum,
On the convertible 5 per cent. preference stock at the rate of £5 per cent. per annum,
On the 3½ per cent. maximum stock at the rate of £3 10s. per cent. per annum,
On the ordinary stock at the rate of £4 13s. 4d. per cent. per annum.

The Governor: I move the adoption of these recommendations.

Mr. Jones seconded the motion; and it was carried unanimously.

Votes of Thanks.

Mr. R. J. N. Neville proposed a very hearty vote of thanks to the Governor, the Deputy-Governor, and his colleagues on the Board for all they had done for the shareholders. He did not think anyone who had followed the progress of the Company for the last ten years could possibly have believed that within that time they would have been in the position they now occupied. Those who had passed through the dark and troublous years when they were in Parliament, and when every Municipality was up in arms against them, if they compared those years with the present, would see, as the Governor had told them, that the Municipalities had been conciliated, the price of gas had been reduced, the dividends had gone up, and co-partnership had been carried through successfully. And not only this, but £100,000 of capital unrepresented by plant had been redeemed out of dividends; and this process was going on. He felt sure there was not a shareholder who did not feel that he owed a great debt of gratitude to the Board and their officials. They had the best possible hopes for the future that the Board would live up to what they had done in the past. As it was said, everything came to those who waited; and he thought the shareholders would see that the position of the Company in the near future would be strengthened. There was not the slightest doubt that there was an enormous future for gas undertakings in this kingdom, if they could only get people to take an interest in them; and, if there was any one who could push forward and advance the progress of the Company, he was perfectly sure it was the Directors and the officials who stood behind them. He felt sure the proprietors had absolute confidence in the Board, and also that the Board would do even more for the proprietors in the future than they had done in the past.

Mr. J. Reeson, in seconding the proposition, said he felt great pleasure, when looking back at the troublous times, in knowing that a forward policy was being adopted, which he was sure would be successful.

The motion was carried unanimously.

The Governor: Ladies and gentlemen, we are all pleased to see so many ladies gracing our meeting; and I am sure that we are all very much obliged to you for the vote you have just passed. I am glad that reference has been made to the satisfactory passing of the Bill by reason of the non-opposition of the Municipalities of London. I am sure that in the story of the past few years there is nothing more gratifying than the altered relations of the Company with both its consumers and the local authorities. We were prepared to go a little further than we otherwise might have gone to fully maintain these amicable relations. I am also glad that Mr. Neville included in the vote of thanks the officers of the Company. I will not add anything to what he has so well said, except to say that we appreciate very highly the services rendered by our staff, and we are proud of the men we see around us.

WEST HAM GAS COMPANY.

Half-Yearly Report and Accounts.

In the report for the six months ending the 30th of June which the Directors of the Company will present at the general meeting to be held to-day, they say it will in all probability be the last ordinary half-yearly report they will present to the stockholders; but they intend summoning a special meeting in December to receive a final report of their actions in connection with the Company's affairs.

The accounts accompanying the report show that the sale of gas produced £121,159; the rental of meters, stoves, and fittings, £18,840; residuals brought in £24,828; and the total revenue was £164,864, compared with £160,071 in the first half of 1908. The manufacture of gas cost £83,355 (coal, coke, breeze, and oil figuring for £56,928, and repairs and maintenance of works for £14,865); distribution entailed an expenditure of £31,181; management cost £5670; the total expenses were £129,587, against £124,230. The balance carried to the net revenue account is £35,277, compared with £35,841; and the amount available for distribution is £52,045 (of which £21,455 has been brought forward), against £51,234. The Directors recommend that dividends at the rates of £5 and £5 7s. 6d. per cent. per annum be paid on the preference and consolidated ordinary stocks respectively for the half year. These will amount to £29,326, and leave £22,719 to be carried forward. The last dividend on the ordinary stock was at the rate of 5¼ per cent.; but the price of gas having been reduced by 1d. per 1000 cubic feet last Michaelmas, the proprietors are entitled to the additional dividend of 2s. 6d. per cent. per annum. The Directors remark that the fact that the profit balance of the past six months (£30,590) has by itself provided the dividends recommended and left a sum of £1264 to be added to the previous carry-forward, will, they believe, be considered very satisfactory. At the date of the report (July 27), the Bill to sanction the amalgamation of the Company with the Gaslight and Coke Company had been passed by the Committee of the House of Lords and ordered to be reported for third reading. This stage was successfully passed last Wednesday.

Statements relating to manufacture show that 49,958 tons of coal, 160 tons of cannel, 842,341 gallons of oil, 7551 tons of coke, and 2137 tons of breeze were used in the production of 963,275,000 cubic feet of coal and water gas, of which 855,834,000 cubic feet were sold and 924,419,000 cubic feet accounted for. The residuals produced in the half year were: Coke, 30,309 tons; breeze, 7197 tons; tar, 749,991 gallons; sulphate of ammonia, 653 tons.

Methane-Hydrogen Plant for the St. Mary Church Gas-Works.—At the meeting of the Torquay Town Council last Tuesday, Mr. Foster submitted a recommendation by the Gas Committee that there should be an installation of methane-hydrogen gas-plant at the St. Mary Church Gas-Works, at an estimated cost of £1200. He said this would have the effect of saving upwards of £700 a year; and it was hoped that at a future date the Committee would be able to still further reduce the price of gas.

Gas Poisoning at Newcastle-under-Lyme.—At the Newcastle-under-Lyme Police Court last Wednesday, Edward Botham, aged 55, a collier, was charged on suspicion with having caused the death of Elizabeth Botham between the previous Monday evening and Tuesday morning. The woman was found asphyxiated, and her husband, Thomas Botham (brother of the accused), unconscious; the house being full of gas, which was escaping from a severed pipe downstairs. The only people who spent the night in the house were Mrs. Botham, her husband, and the accused. The Chief Constable stated that the gas-pipe leading from the main to the meter had been hacked through with a hatchet [produced], which bore traces of lead on it. Thomas Botham, who was removed to the Workhouse Infirmary, had recovered consciousness. Ethel Botham, daughter of the deceased, gave evidence of the discovery of the tragedy. The Chief Constable applied for a remand, and the accused was admitted to bail on his own recognizances. An inquest was opened later in the day and adjourned.

SOUTH SUBURBAN GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Friday, at De Keyser's Hotel, Victoria Embankment, E.C.—Mr. CHARLES HUNT in the chair.

The SECRETARY (Mr. Charles M. Ohren) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving their adoption, said his opening observation must be a personal one. The first paragraph of the report mentioned the decision of Mr. Morton not to continue the chairmanship. Much as the Board regretted this decision, they had no alternative but to bow to it. Mr. Morton was one of the veterans of the gas industry, and had fully earned a right to a position of comparative rest. His colleagues hoped, however—and he (the Chairman) was sure the proprietors did also—that Mr. Morton might be long spared to give the Company, as a member of the Board, the great benefit of his sound judgment and ripe and wide experience in all matters relating to gas supply.

THE GENERAL RESULT.

The accounts showed that sufficient profit had been made during the half year to enable the sum of £4500 to be placed to the credit of the insurance fund, which brought it up to within something like £1000 of the statutory amount. After providing for the payment of the full dividend authorized under the provisions of the sliding-scale, the balance to be carried forward would be about £600 in excess of that brought forward from the previous half year. This result was the more gratifying because the advantage gained in lower prices for coal had been more than counterbalanced by the lower returns from residuals—the price of coke in particular having been very much reduced. There were, however, indications that the bottom had been reached in this regard. But taking the accounts as they stood, and putting on the one side the saving in the cost of coal, and on the other side the loss on residuals, there was an adverse balance of upwards of £1700.

THE MODERN METHOD OF OPERATING RETORTS.

Fortunately, however, there had come to the rescue, what was referred to in the report as "a notable advance in carbonizing methods." He felt sure the proprietors would not be disposed to find fault with this description of methods by which, as compared with the corresponding half of last year, there had been a saving of no less than 4800 tons of coal, notwithstanding an increase in the output of gas of over 16 million cubic feet, which represented another 1400 to 1500 tons of coal saved. In other words, there had been an actual increase in the quantity of gas sold per ton of coal carbonized of upwards of 1000 cubic feet. He was certain the proprietors would agree that such a result as this reflected the highest credit upon their Engineer (Mr. Shoubridge) and upon all who were associated with him in the carbonizing department. He might say that the result had been brought about mainly by the adoption of what might be called the modern method of operating retorts from one end only, instead of from both ends simultaneously, as was formerly almost the universal practice, and by means of a system of machinery which enabled the weight of coal put into the retorts to be almost indefinitely increased. This had resulted in a great saving in the cost of handling both the coal and the coke. And, at the same time, by increasing the intervals between the charges so as to allow a longer period of carbonization, it was found that the yield of gas was much greater than was possible by the ordinary system of smaller charges at shorter intervals. Carbonization, he might say, was receiving just now more than the usual amount of attention, owing to the introduction of new processes which had for their object the supersession of the horizontal and inclined systems. These were receiving the careful attention of their Engineer, with the view of the adoption of one or other of them should this be found desirable. Of one of these processes it was recently said by a very eminent German Gas Engineer, that the result showed "an advance along the whole front of carbonization." This was a result by which any system of carbonization must ultimately be judged. They might not have attained to this with the horizontal retorts; and it might not be possible to do so. At the same time, the recent experience seemed to show that the capabilities of the horizontal retort had not yet been exhausted.

THE 14-CANDLE STANDARD AND THE CALORIFIC POWER TEST.

Among other advantages that had been derived from this change of method, it might be mentioned that it had definitely solved the somewhat vexed problem of how to make from coal 14-candle gas; the average illuminating power during the past half year having been about 14½ candles. They were, therefore, now practically working down to the standard first prescribed by Parliament in the case of the South Metropolitan Company's Act of 1900, and which had been practically adhered to by Parliament ever since. There could, however, be no such thing as finality about 14-candle gas. When Sir George Livesey was before the Parliamentary Committee in 1900, he was asked by the Chairman—Sir George having made out such an excellent case for the reduction of the illuminating quality—why he did not ask for more than a 2-candle reduction; and when the South Suburban Bill of 1903 or 1904 was before Parliament for a reduction to (he thought it was at that time) 13 candles, the Chairman of the House of Commons Committee expressed the opinion that it would be a good thing for the public if gas companies could see their way to supply gas as low as 8 candles. From this was seen the feeling of the Legislature with regard to this matter; and it was seen also that it was their own carbonizing methods that had been lagging. The time, however, was probably not far distant when they would be in a position to ask either for a further reduction of the standard of illuminating power, or, what would perhaps be better, the abolition of the illuminating power test and the substitution of one for calorific value only. The importance of illuminating power as such was now mainly confined to flat-flame gas-burners, the use of which was disappearing. In the present session of Parliament, a calorific power test had been submitted to by the Gaslight and Coke Company; and, although as an addition to the ordinary illuminating power test this was not a precedent to be followed, and although, also, its imposition was by consent of the Company under somewhat special circumstances, and as subject to revision by the Board of Trade at the end of three years—it nevertheless marked an era, and might probably be regarded as the first step towards the abolition of the illuminating power test. In fact, Dr. Frank Clowes, the eminent Chief Chemist to the London County Council, in a recent article on the subject in "The Times" Engineering Supplement, while stating that "there is still a sufficient number of flat-flame burners in use to make the illuminating power of the gas, at least for a time, of importance," went on to say: "Possibly at no distant period, the illuminating power test may lose even the restricted importance which it at present possesses." This from the standpoint of the writer of the article seemed a perfectly fair view to take; and though they might think that Dr. Clowes attached somewhat too much importance to the flat-flame burner, they, at all events, saw where gas suppliers were, and what it was that was likely to stand in the way of further progress. Some time ago, it was remarked of one of the most important cities of Europe that such a thing as a flat-flame burner was not to be found in it. He (the Chairman) wondered how long it would be before the same thing could be said of any town or city in the United Kingdom.

CONSUMPTION INCREASES UNDER ADVERSE CIRCUMSTANCES.

There had been an increase in the quantity of gas sold—not a large one it was true, but a distinctly encouraging one under the circumstances. Depression of trade had made its mark in the Company's district in a larger number of empty houses than had been known for many years. Consumers were also practising economy by the substitution of inverted for upright incandescent burners, by which they were enabled to save in consumption 10 to 15 or even 20 per cent.; and the Directors were doing their best to encourage the use of these burners, and also the use of any gas apparatus of proved economy, in the belief that advantage to the consumers meant, in the long run, advantage to the Company. On the other hand, gas-fires were increasing in popularity, and had no doubt, during the inclement weather of last spring, contributed to the increase of consumption. Their aim was to assist consumers in every possible way, so as to extend the use of gas for all purposes. The Company's show-rooms, of which there were three in various parts of the district, in addition to the one at the works, were being made use of by the consumers to an increasing extent. Steps were also being taken to strengthen the outdoor, or what might be more properly termed the sales, department of the business, so as to bring this into touch with consumers in all parts of the district, however remote.

PUBLIC LIGHTING BY INVERTED LAMPS.

It might interest the proprietors to know that the alteration of the Beckenham public lamps, to which reference was made by the Chairman at the last meeting, had now been completed; and the new inverted burners were giving general satisfaction—the "greater brilliancy" of the "improved lighting" having been remarked upon in the Local Press. It might be remembered that this system of inverted burners was devised by a member of the Board—Mr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company. Independent testimony to the great value of inverted burners for public lighting, and at the same time to the superiority of gas over electric lighting for the same purpose, had recently been borne by a Committee appointed by the Corporation of the City of London to inquire into the various systems of public lighting. The Committee made a tour of all the principal cities in Europe, and their inquiry was an exhaustive one. In their report, which had just been published, they recommended "that high-pressure incandescent gas-lamps, with inverted burners, should be adopted as the illuminant;" and they went on to say that, where gas was impracticable, there the electric light should be adopted.

REDUCTION IN PRICE.

It was a great satisfaction to the Directors that they had been enabled, owing to having obtained a further small reduction of the price of coal, to announce another reduction of 1d. in the price of gas; bringing it down to 2s. 5d., which was the lowest price ever charged by the Company. This reduction represented a saving to the consumers of about £5600 per annum, and would entitle the proprietors to an increased dividend of 3s. 4d. per cent. (which there was every reason to believe they would be in a position to pay), as also the additional bonus which would accrue to the co-partners. With regard to dividends, it would be remembered that, by their Act of 1905, the neutral zone extending from 2s. 10d. to 3s. 2d. per 1000 cubic feet (within which there could be no alteration of dividend consequent upon any alteration in the price of gas) was abolished; and the standard price was reduced from 2s. 10d. to 2s. 9d. At the same time, the variation of dividend for every 1d. alteration in the price of gas was increased from 2s. 6d. to 3s. 4d. per cent.; and to the extent of this increase, there was now a stronger inducement than before to reduce the price of gas. As a matter of course, the Company made no pretence of working for nothing; and he had no doubt that any increase of dividend the Directors might be able to give would be acceptable to the proprietors. He could, however, say with all sincerity that, quite apart from any question of increase of dividend, the Board were most desirous of maintaining the honourable tradition of Sir George Livesey's policy, of selling gas cheaply.

NEW EMPLOYEE-DIRECTOR.

The last paragraph of the report had reference to the election of Mr. George Ross as Employee-Director in succession to Mr. Robert Wyllie, who had retired from the service of the Company. He (the Chairman) had much pleasure in repeating what was stated in the report—viz., that Mr. Ross had already proved to be a useful Director, and, he might add, one with whom it was a great pleasure to work. The Directors attached great value to this system of Employee-Directors, because, among other advantages, it formed a connecting link between the Board and the Company's employees, and, as he took the opportunity of saying at the co-partners' dinner the previous week, it helped to create between them mutual confidence and sympathy. He would conclude by saying that the co-partnership system continued to be what it had been from the commencement—an emphatic influence for good to all concerned. The amount of stock held by the co-partners and on deposit was nearly £35,000, exclusive of the bonus now payable. This exceeded the total bonuses paid by fully £1000, notwithstanding

withdrawals to the extent of about £17,000 for investment in other property, and on men withdrawing from the Company's service. He (the Chairman) was sure the proprietors would agree that these figures were very satisfactory.

Mr. Robert Morton seconded the motion; and it was unanimously carried.

The Deputy-Chairman (Mr. Jabez Light) moved the declaration of a dividend for the half year of 5 per cent. on the preference stock, and 5⅜ per cent. on the ordinary stock, less income-tax. He observed that he was sure the resolution would be received unanimously. Following the last reduction in price, there had been an increase of 3s. 4d. per cent. in dividend to the proprietors, and to this had been added an extra bonus to the co-partners. Beyond this, there was the reduction of 1d. per 1000 cubic feet in the current half year. In his view, this was a case illustrating that nothing succeeded like success.

Mr. George Ross said it gave him great pleasure to second the motion. While doing this, he desired to thank the Chairman for the favourable remarks he had made concerning him (Mr. Ross). He did not know that he altogether deserved it. Indirectly, he had a share in the work that made for the prosperity of the Company. It was a small share indeed. But being a co-partner, and a great advocate of the co-partnership system, it happened to be his duty to see that the wheels went round; and all the time the wheels went round Mr. Shoubridge, their respected Engineer, was well satisfied.

The motion was unanimously adopted.

Mr. Harold Gundry moved a vote of thanks to the Chairman, Directors, the officers, and the whole staff. He praised the careful and skilful handling the business received; and remarked that, in spite of the keen competition of the electric light and the formidable oil-lamp, they found themselves on the tide of success; enjoying a satisfactory dividend. The proprietors fully appreciated the results that they saw in the report and accounts. They, however, deeply regretted that Mr. Morton had thought fit to retire from the chairmanship; but, on the other hand, they were consoled by feeling that he had such a worthy successor. They were glad to know the chairmanship was in strong and able hands. The proprietors also welcomed warmly the appointment of Mr. Ross to the Board.

Mr. G. Read Clarke seconded the motion; and it was heartily agreed to.

The Chairman, having responded for himself and his colleagues, endorsed the remarks that had been made regarding the officers and the staff.

Mr. S. Y. Shoubridge, acknowledging the vote on behalf of himself and his staff and workmen, said it was very gratifying to them to know that the results of the operations of the half year had been so satisfactory. They proved, he thought, conclusively, not only the advantage of the adoption of the new carbonizing methods, but also the fact that the principles of the co-partnership system had been very thoroughly taken to heart by the employees. He could testify that they had all done their utmost to promote the success of the Company.

Mr. Ohren also replied, and assured the proprietors that all in his department were striving their very utmost to carry on their duties as true co-partners.

The Illumination of Small Towns.

The following was among the "Notes on Gas Lighting" in the "Ironmonger" last Saturday: "Our contemporary the 'Revue des Eclairages' can scarcely be accused of partisanship in regard to the relative merits of gas and electric lighting; and the account by Herr Wurdemann of the cost of illuminating the towns of Bentheim and Anhaus, in Hanover, which it reprints, will be read with considerable interest. Bentheim, with 4300 inhabitants dwelling in 865 houses, has adopted electricity; Anhaus, in whose 900 houses 4599 people reside, uses gas. With respect to the public lighting, Bentheim has 119 incandescent electric lights, which give 6,000,000 Hefner units in 2000 hours per annum, while Anhaus has 110 gas-lamps which, though only lighted during 1600 hours, give 13,500,000 Hefner units. As to the expense, Bentheim pays £350 and Anhaus about £113 for its lighting. On coming to the lighting of the interior of the houses, while 25 per cent. of the houses in Anhaus have gas supply, electricity is only supplied to 18·8 per cent. of the houses in Bentheim; and in addition 1·8 per cent. of the inhabitants have taken gas for cooking purposes. In Bentheim electricity costs 50 pf. (6·2d.) per kilowatt for lighting, and 20 pf. (2·4d.) for power; gas at Anhaus being 16 pf. (2d.) per cubic metre for lighting and 12 pf. (1½d.) for heating. While the Anhaus Gas-Works are making a small profit of about £215 per annum, the Bentheim undertaking has lost £1100 on the year's working. The figures are interesting, for they show plainly the bad financial results which often follow the introduction of electric lighting in small towns, though, of course, where plenty of water power is available, as in the Black Forest and Switzerland, electricity is the obvious source from which to obtain illumination, whether public or private."

Lincoln Gas Undertaking.—The net profit on the gas undertaking of the Lincoln Corporation for the past financial year amounted to £5169, compared with £4562 for the preceding year; the difference being mainly accounted for by an increase of £1239 in the amount received for gas sold. The balance standing to the credit of the gas account in March was £1903, after £3000 had been granted in aid of the rates. The Gas Engineer and Manager (Mr. John Carter) says that last year was the most successful the department had had; the make of gas exceeding that of the previous year by 13½ million cubic feet.

Buenos Ayres Gas Amalgamation.—It has been officially notified by the Primitiva Gas and Electric Lighting Company of Buenos Ayres, Limited, the Buenos Ayres (New) Gas Company, Limited, and the River Plate Gas Company, Limited, that an *ad referendum* agreement with the Municipality of the City of Buenos Ayres was passed by the Municipal Council on the 30th ult. This agreement, it may be remembered, covers an amalgamation of the three Gas Companies of Buenos Ayres. Meetings of the shareholders of the Companies will be called in due course to consider the acceptance or otherwise of the agreement.

TOTTENHAM AND EDMONTON GAS COMPANY.

The Ordinary General Meeting of the Company was held last Saturday, at the Gas-Works, Willoughby Lane, Tottenham—Mr. Corbet Woodall in the chair.

The Secretary (Mr. E. Topley) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

THE NEW ORDER OF THINGS.

The Chairman said that he did not propose to detain the proprietors at any length in moving the adoption of the report and accounts. They met once a year now, it had become the custom, at the gas-works, in order that they might see the property, understand a little as to the work that was being carried on there, and satisfy themselves that the money subscribed had something that worthily represented it in the shape of buildings and plant. He might say it was always a pleasure to meet the proprietors of the Company, especially when they had a good balance-sheet to present; and, as they never had a bad one, perhaps the qualification was unnecessary. This was the fifty-first half-yearly meeting held since he (the Chairman) became a Director; and it was the twentieth over which, with one exception, he had presided as Chairman; and during this long period the story of the Company had been one of growing and almost uninterrupted prosperity. To-day the statement the Directors offered to the proprietors was worthy to rank with the very best they had ever had. He was especially glad this was so, because, as they were all aware, they had completed the first year of their experience under the new order of things by which practically everyone of their employees had been made a partner in the undertaking, and had been given an added incentive to strenuous effort in its service. The start had been a good one; and if later on they fell away from the good standard that had been established, the Directors would be at liberty to say to the new co-partners, Why is this?

A BUOYANT BUSINESS.

His friend the Deputy-Chairman, who at very short notice was good enough to take his place at the last half-yearly meeting, made some observations as to the difficulty in an undertaking growing at the rate at which this one was doing, of living up to a high percentage of increased output—that was to say, it was one thing to have an increase upon a business of 20 millions; it was quite a different thing to have the same rate of increase on a business of ten or twenty times the amount. Five per cent. upon their business ten years ago meant 25 million cubic feet; 5 per cent. on their business to-day meant 69 million cubic feet. He had occasionally felt anxiety on the same score, especially when considering with Mr. Broadberry the scale on which extensions of works should be designed. Still the progress was maintained; the growth of their output was as buoyant as ever; and so far as he could see, this state of things would continue, if they maintained the policy of the past—watching carefully their expenditure, but never grudging what was necessary in order to ensure the most efficient and economical results. The increase in the sales of gas in the past half year had been 8¾ per cent. over 1908, although that half year had an increase of 10¼ per cent. over the corresponding half of 1907. This 8¾ per cent. meant in gas made about 60 million cubic feet. The direction development was taking was shown by the fact that, while they had sent out more ordinary meters by 4·8 per cent., or nearly 5 per cent., the increase in the prepayment meters had been over 17 per cent.; and while the extra gas supplied through the ordinary meters had amounted to 20 million cubic feet, the extra gas supplied through prepayment meters was 36 million cubic feet. This increase was due not only to the growth in the number of consumers, but also to the amount consumed by each individual consumer. This had arisen by reason of the fact that the Company were now allowing the prepayment consumers to have stoves free of rent. The result had been that the average consumption per consumer, which was in 1907 6474 cubic feet, and in 1908 6832 cubic feet, had been for the past half year 7162 cubic feet. This meant over 14,000 cubic feet per consumer per annum, which was very satisfactory.

PUBLIC LIGHTING.

There had been a falling off in the demand for public lighting, because certain of the main roads in Tottenham were now served by electric lamps. The net loss in the number of lamps was 94. The Directors regretted this for the sake of the revenue lost, and also he might say because they felt so strongly that the change was unnecessary. They were quite satisfied the Company could give much better service for less money. In this respect, Tottenham (which they regarded as a town in the van of progress) had dropped a little behind. He was glad to report that a contract had been entered into with Edmonton for a period of ten years for the supply of gas to the public lamps. Most of the public lamps in the Company's district were now lighted and extinguished automatically. A considerable saving in the cost had thereby been secured. He thought it was palpable to anybody that there was a great waste in hand lighting. The men were occupied for at least an hour going round to light the lamps, so that the last one was alight before sunset; and they had to put in an hour's work in the early morning to extinguish them. Now that the lamps were automatically lighted and extinguished respectively night and morning practically simultaneously, there was a considerable saving; and a further advantage to the men was that they had not to turn out at an unconscionable hour, no matter how inclement the weather, for the purpose of extinguishing the lamps.

UNACCOUNTED-FOR GAS.

Complaint was made at the last meeting that the percentage of unaccounted-for gas was high. He remarked at the time that they must wait for a whole year's record before they came to the conclusion whether or not it was high. For the past half year, they found, instead of it being something like 7 per cent. it was 1·67 per cent. He was sure the 1·67 per cent. was as wrong as was the 7 per cent.—at any rate, the average was a perfectly good one. He was bound to admit he did not understand the year's record at all; and they must be content to accept the satisfactory fact.

CAPITAL ACCOUNT.

Turning to the accounts, they found the capital expended during the half year was £16,554, or at the rate of £300 per million upon the amount of the additional gas sold. Over the whole output, the capital now represented £440 per million cubic feet—a rate upon which the Company might well be congratulated. The subscribed capital was over-spent by £26,100; and so long as they could borrow money at the rates obtaining at the present time, the Directors had no intention of issuing further stock or debentures, in order that they might have a balance in hand. They would not need to call for additional capital, at any rate, before the spring of next year.

REVENUE ACCOUNT.

The revenue for gas showed an increase of £4500, although the price charged was 1d. per 1000 cubic feet less than last year. Residuals were only down by about £300; and the total receipts for gas, rents, and residuals were more by £6000. They had used 2635 tons of coal and 70,000 gallons of oil more respectively than in 1908, and although these materials were bought at lower prices (coal cost an average of 8d. per ton less than in 1908) the extra cost amounted to £1176. Upon repairs of works, they had spent more by £3000; and one other item of special interest was the charge of £624 extra for rates. This apparent increase was not a real one. A year ago the Company were contesting the rates with the authorities. For that reason, they did not then pay the whole of the rates due; and these had been paid up in the past half year. He might mention that carbonizing wages were at the lowest level they had yet attained. The use of machines had brought about this result, while the wages of the men had been fully maintained, and their labour made less exhausting.

CO-PARTNERSHIP SCHEME.

The only other item calling for special notice was the co-partnership bonus of £1300. For the past twelve months, the contribution to co-partners out of the funds would be £2300; and if they added the special sum advanced to start the scheme—the so-called "nest egg"—the total amount distributed in the year was £6272. This was a very large sum; and might be taken, in some measure, as an indication of the seriousness with which the Directors regarded the new departure. While they were unfeignedly glad to know that the new system opened a better prospect to the employees and their families, the Directors would have no right to devote the funds of the Company for this purpose only. The scheme was not one of philanthropy. It embodied a business transaction; and the Directors believed it would be profitable to both parties. They expected that the head, and to some extent the heart also, of the employees would be brought to aid their hands; and that intelligent effort would bring further prosperity to the Company. Might he urge upon the co-partners how desirable it was that their investment with the Company should grow; and therefore they should aim at leaving all bonuses in, and not a half only, for that purpose?

GENERAL RESULT.

The general result of the working was that, after providing the £1300 to which he had referred, and in face of a charge of 1d. per 1000 cubic feet less for gas, which represented £3000, they had as net profit £2000 more than in the corresponding half of last year. For the immediate future, he was glad to report that their purchases of coal and oil had been made at lower prices, and that, consequently, the prospect of increased profit was good. He should be surprised if shareholders, consumers, and co partners were not rejoicing together at the meeting a year hence on a lower price of gas, a better divided, and an increased bonus. He concluded by formally moving the adoption of the report and accounts.

The Deputy-Chairman (Sir Daniel F. Goddard, M.P.), in seconding the motion, said there was only one observation of the Chairman's to which he would allude. He said, at the beginning of his remarks, that it was always a pleasure to meet the proprietors of the Company. He (Sir Daniel) thought the proprietors would rejoin that it was always a pleasure for them to meet the Chairman. They were all—Directors and proprietors generally—very glad indeed that Mr. Woodall had been restored to health, and able to take his wonted place, and make his speech on the present occasion. This had done more to enlighten the proprietors on the affairs of the Company than any other speech could possibly have done.

Mr. Moore inquired whether the co-partnership scheme was going forward satisfactorily.

Mr. E. R. Cass, speaking as a co-partner, said he and his fellow employees desired to thank the Board for having introduced the system of co-partnership, which had entitled them to attend the meeting, feeling that they had an interest in the Company now beyond the weekly wage, which, up to recently, had been their only reward. They now felt they had an opportunity of saving money which otherwise they would not have had; and they were indeed proud of being co-partners in the Company. The trust the Directors had put in the employees, they would do their best to justify by furthering the interests of the Company.

The Chairman said he believed Mr. Cass had voiced the sentiments of his fellows in the service; and as he had pledged himself in their name that the best should be done by them to make co-partnership a success, he, on behalf of the Directors, could only repeat the pledge already given, that they would do the same in so far as it was in their power. Mr. Moore had asked a question as to whether the scheme had, up to now, been an unqualified success. As the question had been asked, he would read a few lines from a letter which Mr. Broadberry wrote to him the previous week:

I am glad to say that many of the men do already realize the advantages, and work with more thought and goodwill, and less waste of time and materials, than formerly. There are others who do not yet seem to have realized that thought and attention to these matters are of any advantage to them personally. But, as the years go on, the appreciation will no doubt sink into their minds to the same extent as it has done into those that grasp it more readily. On the other hand, I am sorry to say that, in one or two cases, we have come across men who are so hopelessly unthrifty that, as soon as they obtained the knowledge that the nest-egg bonus allotted to them was their own property, they were anxious to sell it, even at the risk, and with the full knowledge that, if they did so, they would be considered not only unworthy to continue as co-partners, but also that they were unworthy to be continued in the same employment as co-partners.

That was a perfectly candid statement of their experience so far; and when they found that only one or two—a very small number—of the great number who were now co-partners had been tempted to realize the money that came to their share, he (the Chairman) thought they might be very well satisfied with the result.

The motion was unanimously carried.

Mr. Henry Bailey moved the declaration of the full statutory dividends at the rate of 6⅝ per cent. per annum on the "A" stock, and 5⅜ per cent. per annum on the "B" stock. He remarked that it would be seen from the accounts that ⅛ per cent. more was to be paid; this being due to the lowering of the price of gas. That the Directors were able to do this, showed that the Company were prosperous—that they had been able to earn sufficient, not only to allow a large sum to the consumers, but also a large sum to the co-partners, and also to pay the proprietors an additional, though comparatively small, amount by way of dividend. He thought the co-partners had been working better, and had contributed to this result.

Mr. James Cloudsley, J.P., seconded the motion; which was unanimously adopted.

Proposed by the Chairman, and seconded by Mr. Osborn, Mr. James Cloudsley was re-elected to the Board; as was also Mr. James Randall on the motion of the Chairman, seconded by Mr. Haward.

Moved by Mr. Row, and seconded by Mr. Moore, Mr. Edward Crowne was re-appointed one of the Auditors.

Mr. Crowne, in his acknowledgment, heartily complimented the Secretary (Mr. Topley) on the manner in which the books of the Company were kept.

A Well-Deserved Increase of Salary.

Mr. Bailey observed that all must recognize, as the business of the Company increased, that the Secretary's work increased with it. The number of ordinary consumers continued to grow, and the number of the prepayment meters was growing still faster. He believed since the Secretary came into office, the output of gas had increased by 30 per cent. Besides, the co-partnership scheme started last year entailed much more work for both the Secretary and the office. This work had been most efficiently done. He therefore proposed that the Secretary's salary be increased by £150 per annum.

Mr. W. B. Randall seconded the motion; and Mr. J. L. Chapman (as Auditor and proprietor) bore testimony to the Secretary's worth.

The proposition was cordially agreed to.

Moved by Mr. Haward, and seconded by Dr. Scott, the Chairman, Directors, officers, and employees generally were thanked for their services.

The Chairman having responded,

Mr. Topley, in returning thanks for his department, acknowledged the kind remarks as to his services, and the tangible recognition that had been made of them.

Mr. Broadberry also replied to the vote on behalf of himself, his colleagues, and the staff of workmen.

A Centre of Social and Progressive Life.

The meeting on this occasion was held in a fine new building, which stands in a prominent position at the entrance to the works, and is a great improvement. Below there are the various works' offices; above, with an entrance outside the works' gates, is the large room in which the meeting was held. The meeting, by the way, was more numerously attended than any previous one. During the proceedings, the Chairman remarked that the room in which they were meeting for the first time that day would be employed in the future as the home of co-partnership at Tottenham, as well as for the Athletic Club and the other institutions of the men. It had been provided, and would be finished, with the object of being the centre of the social and progressive life of the employees of the Company. On the wall behind the Chairman, was displayed the following: "Co-Partnership: Diligence and carefulness produce extra profit. Co-Partners share it."

WANDSWORTH AND PUTNEY GAS COMPANY.

Half-Yearly Report and Accounts.

The accounts for the six months ended the 30th of June last, which will be presented at the half-yearly meeting of the above-named Company next Tuesday, show a profit of £13,544. The revenue from the sale of gas was £53,179; from the rental of meters and stoves and the maintenance of incandescent mantles, £9775; from residual products, £20,017—the total receipts being £83,334. The expenditure on manufacture of gas was £51,267 (coal and oil costing £33,334, and repair and maintenance of plant £11,283); on distribution, £10,718; on management, £3349—the total expenses being £69,790. After providing, out of the above-mentioned £13,544, for the interest on debenture stock and on deposits and loans, there remains to the credit of the profit and loss account, with the balance brought forward, £19,225 available for distribution. The Directors therefore recommend that dividends should be declared at the statutory rates per annum (in accordance with the reduced price of gas at 1s. 11d. per 1000 cubic feet) of £8 2s. 6d. per cent. on the consolidated "A" stock, £6 12s. 6d. per cent. on the consolidated "B" stock, and £5 13s. 9d. per cent. on the ordinary "C" stock. Attached to the report is a slip, printed in red ink, to the effect that, as the Directors cannot withhold lists of the stockholders of the Company, they desire to caution the proprietors against being misled by exaggerated prospectuses of insignificant gas undertakings, which usually make comparisons between the prospects of the suggested investment and those of important and prosperous undertakings. They point out that a simple test of these statements would be to take the capital asked for in relation to the existing sale of gas, and compare it with the same conditions, for instance, in the Wandsworth Company.

BRENTFORD GAS COMPANY.

An Increased Make per Ton—The Question of Coping with the Growth of the District.

The Half-Yearly Ordinary General Meeting of the Company was held last Friday at St. Ermin's Hotel, Caxton Street, Westminster—Mr. Ulick J. Burke in the chair.

The Secretary (Mr. William Mann) read the notice convening the meeting; and the report and accounts—noticed in last week's "Journal," p. 335—were taken as read.

The Chairman said it was his pleasure once again to move the adoption of the report and accounts; and, in doing so, he thought it would perhaps be convenient to the shareholders to have the figures placed before them in some rather condensed form. The principal feature of these figures, they would be glad to know, was that the Company had received from sales of gas £185,307 in the period under review, as against £179,944 in the corresponding half of 1908—that was to say, there was an increase in the past six months of £5363. This was not an unsatisfactory return in itself; but it was further gratifying to know that it had been earned at a less manufacturing cost—less, in fact, by a sum of £9644; the actual figures being £89,703 for the past half year, as compared with £99 347 for the first six months of 1908. They would agree with him that this was a very desirable result, and that it argued very attentive and skilful management on the part of the officers and staff. This saving in the cost of manufacture had been made to a very large extent through a better return per ton of coal carbonized (the production having been no less than 12,116 cubic feet per ton, as against 11,247 feet), and, also, he need not add, by very close attention to detail. One feature in this close attention to detail had been the question of the reduction of the unaccounted-for gas. It would be within the recollection of the shareholders that at the time of the last meeting the Board were a little anxious about the unaccounted-for gas, which had risen, not only with their Company, but also with others. It had got up as high as 7 per cent. But now it had fallen to 5 per cent., which he thought, on the whole, they would accept as a normal figure. As a result of this good working, they had a sum of £88,959 applicable to dividends; and not only had those recommended been earned, but after their payment there would be a surplus over of £2536. Well, to all this there was, needless to say, a reverse side. They had, first of all, their old friends rates and taxes, which showed an increase of no less than £1553; and coke sales had also been against them, for there was a reduction under this head of £5985. Both of these were matters over which the Board could not very well exercise control. From one cause and another, the coke market had been very dull; and, from what he could hear, he did not, on the whole, think that they could expect much improvement at present. The weather also had been playing them pranks. If there was dark, cold weather in winter, people were glad to burn gas; and if there was a hot summer, they were also pleased to use the gas-stove for cooking, rather than have the kitchen over-heated by the coal-range. But instead of this, they had been experiencing a lot of weather that was just cold enough in the summer months to make people wish to use their kitchen coal-fires for the sake of the warmth, and so the Company did not experience that consumption of gas for cooking purposes which they rather looked for. In spite, however, of these drawbacks, there had been, as was stated in the report, an increase of 3·2 per cent. in the quantity of gas sold. The business generally was increasing, and not only the business, but the district. Now, because of this growing district, he wanted to say a few words as to what they were going to do to meet this growth. The works, so far as they went, were in excellent order—he did not wish to mislead the shareholders on this head. That was to say, they had been kept in as good order as skill and attention could keep them. But, to put it shortly, they were not up-to-date, and they were not equal to the strain which a large, and perhaps sudden, demand for gas would make upon them. The Company had, as he had told the proprietors before, experienced some difficulties now and again in the matter of pressures. The new 30-inch main which had been laid between Brentford and Southall tended to mitigate anxiety in this regard; but it was only a palliative. That was to say, it reduced the present calls on the plant; but it was not sufficient to provide for future highly probable increases in demand. The proprietors might, perhaps, have noticed that for the last four years or so there had been practical freedom from very thick fogs and from continuous sharp weather. But these were things that a gas manager always had to look out for; and if they had such calls, it might become a matter of grave anxiety as to how they should meet them. They had at present practically surplus manufacturing power equal to 2,800,000 cubic feet of gas per day. This sounded a very comfortable reserve; but unfortunately no less than 1,800,000 cubic feet of this surplus was supplied from No. 2 retort-house at Southall, which was in a not very satisfactory state. It was as satisfactory as they could make it; but it needed reconstruction. Therefore they could not altogether depend upon this surplus of 2,800,000 cubic feet. Now, then, let them look fairly at the position. They had a big, growing district, and what were practically sparse works to serve it. Well, this was no new story. He had harped upon it several times before. Again and again, he had advised the shareholders from the chair that, prosperous as was the Company, there was need for a large expenditure to keep pace with its growth, and to provide for its anticipated growth. At the last meeting, it would be remembered, he sketched the difficulties which were caused by the position of their stations. There was Brentford, in the middle of the district, very much cramped for room, and overtaxed. Southall, too, which was a station on which they largely relied, was quite on the outer edge of the district, and was so placed as to enhance the cost of coal supply and to reduce the amount that they could get for coke. This was a somewhat inconvenient and uneconomical state of things; and he could tell them that, so much was this the case, that the Board had had under serious contemplation whether it would not be wise to construct fresh works altogether. This, of course, would be a rather fascinating, if rather drastic, way of treating the question; but it would be rather a big order. It would mean scrapping a very large part of the works—with the exception of the gasholders; and, further, it would mean, what was a very serious matter to all companies now-a-days, a contest in the Parliamentary Committee Rooms. When undertakings went to the Committee Rooms now, they were very apt to be saddled with serious conditions; and it became a question, of course, whether it was better in these cases to accept the conditions laid down, or to withdraw the Bill. They could go to Parliament, and then withdraw the Bill if the conditions were so onerous that they did not feel inclined to accept them. But in this way they would have to wait a long while before they would know where they really were. This was a great consideration; for time with them in this regard was very important. Taking all these matters into account—and they had been very ably advised on the matter—the Board had come to the conclusion that it would be wiser, on the whole, to make the best of the material and parliamentary powers which they now had, and to reconstruct the works at Southall. The Board had had serious discussions over this; and they had not adopted the course mentioned without most careful consideration. But, having adopted it, he must inform the shareholders that the scheme was going to cost a good deal of money. It was, however, absolutely essential that they should spend the money; and therefore the situation must be faced. The Directors estimated that the work would cost not less than £80,000. A large proportion of this would be a capital charge; and, as they saw in the report, it was proposed to issue fresh stock to meet this. He thought what he had said gave them very shortly and plainly the position of the Company so far as he could state it. Before concluding, he had one very sad duty to perform, and this was to remind the proprietors that since the last meeting they had lost an old and highly-valued friend in Mr. Howard Charles Ward. For 58 years he had served the Company with a devotion, and indeed he might say with an affection, which had tended very much to establish its well-being and to advance its progress. The loss to the Board was a very great one. He only wished there were many more like him. In Mr. Ward's place they had elected Mr. D. Milne Watson, a gentleman who was well known to the shareholders—at all events, to many of them; and he could only congratulate the proprietors very heartily on the experience and knowledge which this new Director had brought to the counsels of the Board. He then moved the adoption of the report and accounts.

Mr. R. J. Neville Neville, in seconding the motion, remarked that Mr. Ward was one of his dearest friends. He had known him for about forty years. He did not think there was anyone present who remembered a meeting without Mr. Ward being present. He was the cheeriest of the cheery. He had the heart of a boy with the kindliness of a man; and many of the shareholders and employees of the Company would greatly miss their dear old friend Mr. Ward. The final appearance of Mr. Ward was at the last meeting—he was working up to the very end. He did not think it was necessary for him to say anything more than that, so far as he knew the Company and was able to form an opinion, the undertaking was in an excellent position. They had a first-rate Engineer—a man of whom they ought really and truly to be quite proud, and of whom they were proud; and they had also had the benefit of the advice of two of their recent colleagues, who had added greatly to the strength of the Board. He alluded to Mr. William King, an expert well known in the gas profession, and to Mr. Milne Watson, who was the General Manager of the Gaslight and Coke Company, and whose very position alone had brought enormous strength to the Brentford Company. They might thus, as far as he could see, face the future with the greatest possible confidence that the business would increase and their prosperity be maintained.

The resolution was at once carried unanimously.

On the motion of the Chairman, seconded by Mr. Neville, dividends were declared for the half year to June 30 at the rate of 5 per cent. per annum on the 5 per cent. preference stock, 12½ per cent. per annum on the consolidated stock, and 9½ per cent. per annum on the new stock, 1881—subject to income-tax.

Mr. T. Wilkins proposed a hearty vote of thanks to the Chairman and Directors for the able manner in which they had conducted the business of the Company during the past half year.

Mr. Piper seconded; and the proposal was cordially agreed to.

The Chairman, in acknowledgment, remarked that the present report was, on the whole, a gratifying one; and the Board would do their best to present similar ones in future.

NEWPORT (MON.) GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday—Mr. R. Laybourne in the chair.

The Secretary (Mr. T. H. Hazell) having read the notice convening the meeting, the report of the Directors, with the accounts for the six months ending the 30th of June, was presented. The latter showed a balance of £10,120 on the profit and loss account; and the Directors recommended the payment of the statutory dividends.

The Chairman, in moving the adoption of the report, said the statutory dividends would be paid without drawing upon the reserve fund; and this was always satisfactory. The demand for coke had fallen off during the past half year; and, as a result, the receipts were £1346 less than for the corresponding period of last year. The saving in the price of coal had not been so large as the Directors had anticipated; but in other respects the accounts were about normal. He was pleased to direct attention to the increasing popularity of the Workmen's Thrift Society. They had £1246 on deposit; showing a recent advance of several hundred pounds, in addition to investments in the gas undertaking. It indicated the men's confidence in the Society.

Mr. Cartwright seconded the motion; and it was carried.

The retiring Directors and Auditor having been re-elected, a vote of thanks was accorded to the Directors and officials, for their efficient and satisfactory services.

The Chairman having briefly acknowledged the vote on behalf of his colleagues and himself,

The Secretary responded. He said that though they were assembled

at the 131st half-yearly meeting, the Company was as young and vigorous as ever. There had been a large increase in the consumers during the last nine years. In 1900, the number was 9042, and at the end of last year there were 13,486. The Company had done something for the comfort and well-being of the town, for in more than 11,000 houses they had supplied the means for comfortable cooking—cookers being supplied to this extent. All the members of his staff were imbued with a desire to give their most loyal services to the Company; and in proof of their confidence almost every one had invested his savings in the stock of the concern.

The ENGINEER (Alderman T. Canning) also returned thanks. He said it was a matter for satisfaction to learn of the success of the gas-works under the able chairmanship of Mr. Laybourne and the Directors, with the assistance of the officials. He regarded the works as progressive; and every member of his staff did his very utmost for the success of the concern.

CAMBRIDGE GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday—Mr. E. H. PARKER in the chair.

The SECRETARY (Mr. A. E. King) having read the notice convening the meeting, the report and accounts for the six months ended the 30th of June were presented. The latter showed a balance of £21,703 on the profit and loss account; and the Directors recommended the payment of the maximum dividends. They also recorded with satisfaction a further reduction in the price of gas to 2s. 8d. per 1000 cubic feet.

The CHAIRMAN, in moving the adoption of the report, congratulated the shareholders on the continued prosperity of the Company. He said that during the past half year the Directors had entered into two important contracts. They had undertaken to supply the Fulbourn Asylum with gas; and they anticipated the consumption would amount to about a million cubic feet a year. Secondly, they had entered into an important contract with Messrs. Chivers and Son to supply their factory at Histon; and there, he thought, the consumption would amount to some 3 million cubic feet per annum. These were two very important accessions to their business; and the Directors hoped they would show a reasonable profit. With regard to the half-year's working, they had made a profit of £6093, which was not quite sufficient for paying their dividend and mortgage interest, which amounted to £6208. But in the preceding six months they made a little more than they wanted; and taking the two half years as a whole, they had made their dividend quite easily, notwithstanding the fact that a short time ago they lowered the price of gas from 2s. 10d. to 2s. 9d. per 1000 cubic feet. It was satisfactory to the Directors to be able again to report that the price would be further reduced to 2s. 8d. from the June quarter. Each penny reduction the Company were able to make in the price of gas meant a saving to the consumers of about £1500. The quantity of coal carbonized during the half year was 479 tons more than in the corresponding period of last year; and the make of gas was 201,542,000 cubic feet, against 193,745,000 cubic feet—showing an increase of 7,797,000 cubic feet for the half year. This was a satisfactory feature. It was also gratifying to find the unaccounted-for gas was always diminishing a little. One very important point—and it was one upon which the Directors would like to offer their congratulations to the Engineer and Manager (Mr. J. W. Auchterlonie) and the carbonizing foreman—was that more gas had been obtained from every ton of coal carbonized during the half year. The figures were 11,116 cubic feet in the second half of last year, and 11,254 cubic feet per ton in the past half year—showing an increase of 138 cubic feet per ton. Prepayment meters were started in October, 1898; and now the Company were selling through these meters very nearly 50 million cubic feet a year. This showed what could be done by supplying the smaller houses. The actual quantity sold this half year was 24,119,700 cubic feet, and they received for it in cash £4632 10s. 4d. The average amount of gas for each meter during the past half year was 6083 cubic feet; and the average for the whole year was 12,428 cubic feet. These were very satisfactory figures. There were 205 new slot-meter consumers during the half year. There was an increase of 60 in the ordinary consumers, and of 89 in the number of cookers used. He thought he need hardly mention any further facts to prove that the Company was in a prosperous condition.

Mr. J. FOSTER seconded the motion; and it was carried.

The dividends recommended were declared; the retiring Directors and Auditor were re-elected; and the proceedings closed with a vote of thanks to the Chairman and Directors.

CHESTER UNITED GAS COMPANY.

The Ordinary General Meeting of this Company was held last Tuesday—Mr. J. G. FROST in the chair.

The SECRETARY AND GENERAL MANAGER (Mr. F. A. Pye) having read the notice convening the meeting, the accounts for the six months ending the 30th of June were presented. They showed that the balance to the credit of the profit and loss account, after providing for interest on debenture stock and dividend on the preference stock, was £5189; and the Directors recommended the declaration of an interim dividend on the ordinary stock of 2½ per cent.

The CHAIRMAN said there were several satisfactory features in the accounts; and perhaps the increase in the sale of gas, both within and outside the city, though small, was the most gratifying. Business had been very quiet in Chester, and this increased consumption was caused by an additional number of consumers and cooking-stoves. On the 30th of June they had 397 more consumers, and 330 cookers; making a total of 8678 consumers with 6224 stoves, in addition to those privately owned. The net result of the working was an increased balance of profit of £1000, which was carried to the net revenue account. During the half year, they had settled the terms of new lighting agreements with all the parishes outside Chester, under which larger burners and better lanterns would be used, which would secure to them a great improvement in the lighting of their respective districts. When these alterations had been completed, the several outside residential districts would be as well lighted as the best lighted thoroughfares in the city. The Company opened the year well; and as their success was undoubtedly due to the economy and efficiency of gas for lighting, cooking, heating, and other domestic purposes, they looked forward with every confidence to as satisfactory a report next half year. He moved that the report and statement of accounts be adopted.

Mr. R. L. BARKER seconded the motion; and it was unanimously carried.

An interim dividend at the rate of 2½ per cent. on the ordinary stock having been declared,

Mr. G. R. GRIFFITH moved, and Mr. H. A. LATHAM seconded, a vote of thanks to the Chairman and Directors; Mr. Latham referring with regret to the death of the ex-Secretary, Mr. James Pye, who, he said, was a good old servant of the Company.

The vote of thanks having been passed,

The CHAIRMAN said though Mr. James Pye had not been with the Company for some years, they all felt his death very much.

FINANCIAL ORGANIZATION AND ADMINISTRATION OF MUNICIPAL UNDERTAKINGS.

Proposed Regulations.

The attention of the Council of the Institution of Gas Engineers having been called by various members to the action of the Institute of Municipal Treasurers and Accountants in appointing a Sub-Committee to consider regulations for financial organization and administration, a circular on the subject has been issued by the Secretary (Mr. Walter T. Dunn), accompanied by the draft regulations prepared for the Sub-Committee's consideration. They contain the following proposals:—

That it should be made compulsory for every local authority of sufficient size to appoint a Finance Committee, with general powers of control and supervision of all matters of finance.

The term "Financial Officer" is defined as meaning "the Treasurer, Accountant, or Comptroller acting as the chief financial officer of the Council."

Separate annual estimates of capital and revenue accounts shall be submitted to the Finance Committee by every Committee of the Council, in such form, and under separate headings, as the Finance Committee may prescribe. The preparation of the estimates shall be by the various heads of departments in consultation with the financial officer.

"He" (presumably the financial officer) shall present the draft estimates to the various Committees for approval, and at the same time furnish the Finance Committee with a copy thereof.

The Financial Officer shall bring up to the Finance Committee the annual estimates approved by the various Committees.

In considering the capital estimates, the Finance Committee shall have regard to the maximum amount which, in their opinion, the Council should seek to borrow in the year.

No liability exceeding £50 shall be incurred (by any Committee) without the express sanction of the Council, except in the case of Committees acting in pursuance of statutory or specially delegated powers of expenditure.

It shall not be in order to submit estimates to the Council through any Committee other than the Finance Committee, except in cases of urgency or where the Council are under statutory obligations to proceed.

No recommendation or proposal involving expenditure on capital account shall be submitted to the Council until an estimate is submitted by the Finance Committee to the Council.

The Heads of Departments shall submit to the Financial Officer the contractor's detailed accounts and measure bill for his examination and comparison with the contract, specifications, and bills of quantities, also a statement showing the additions and deductions on the contract (if any); and the final certificate of the heads of departments is not to be issued until this has been done.

The Heads of Departments shall furnish the Financial Officer with particulars of all estimates and tenders.

The whole of the account keeping relating to stocks and stores, works accounts, and cost accounts shall be under the supervision and control of the Financial Officer; and all statements of costs shall be compiled by, and issued from, the Financial Officer's department.

It is pointed out in the circular that if the matter is allowed to go through on the proposed lines, the control of every department, whether trading or non-trading, will centre in the Finance Committee and the Financial Comptroller, who will override the powers now exercised by the other Committees and Chief Officers of the various departments. The Council of the Institution therefore trust the members will use every effort to strenuously oppose the movement outlined in the draft; and they will also be glad to be kept advised of any information bearing on the matter.

Southend in Darkness.—A breakdown in the generating station caused the failure of the electric light at Southend on Saturday evening, the 31st ult., from 9 until 9.15. Some of the shops were greatly inconvenienced; but as most of them are fitted with gas as well as electricity, they were able to remain open.

Cheaper Gas at Halifax.—The Halifax Town Council, on the recommendation of the Gas Committee, have adopted a revised list of charges for gas, under which the price to ordinary consumers in the borough is reduced from 2s. 3d. to 2s. 2d. per 1000 cubic feet, and to consumers outside the borough from 2s. 8d. to 2s. 6d. Reductions were also sanctioned for power purposes. The total result, it was explained, would be that there would be £3000 less profit available for the relief of the rates. For the past five years, the profits have averaged £13,900 per annum.

COMMERCIAL GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report that the Directors of the Commercial Gas Company will present at the half-yearly meeting on Thursday.

The revenue account shows a net profit for the half year of £63,922 8s. 7d., which, added to the balance of £20,988 5s. 1d. brought forward from last year, produces a net revenue balance of £84,910 13s. 8d. Deducting therefrom £9026 12s. 10d. for interest, there remains standing to the credit of the net revenue account a balance of £75,884 0s. 10d. available for dividend. The Directors recommend the payment of dividends at the rates of £5 4s. per cent. per annum on the 4 per cent. stock of the Company, and of £5 per cent. per annum upon the 3½ per cent. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year. The Directors announce with much regret the death of their esteemed colleague, the Right. Hon. Sir John Colomb, K.C.M.G., who was for nineteen years a Director of the Company. In conformity with the Acts of Parliament regulating the Company, they have elected Mr. Henry Willingham Gell to the seat at the Board thus vacated. It will be for the proprietors to supply the vacancy in the auditorship consequent on the election of Mr. Gell as a Director. Messrs. B. W. Ellis and B. M. Gill, duly qualified proprietors, have given notice of their intention to seek election as Auditor.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on the 30th of June amounted to £976,405; that £1,076,875 had been added by conversion, making £2,053,280; and that £170,698 remained unissued out of the total authorized capital (including premiums) of £2,235,000. The total amount borrowed on the above-named date was £339,062 10s., and £135,937 10s. was added by conversion; making a total of £475,000, and leaving £79,226 to be borrowed out of the £550,000 authorized. The receipts on capital account amount, with premiums, to £2,584,665 4s. 5d. The expenditure stands at £1,434,075 17s. 6d., with a nominal amount of £1,212,812 10s. added by conversion—together, £2,646,888 7s. 6d. There is consequently a balance of £62,223 3s. 1d. carried to the balance-sheet. The net expenditure on capital account in the half year was £7546 (£8355, less £809 received for land and meters sold), apportioned as follows: New and additional mains, services, &c., £1834; stoves, £1751; prepayment meters and fittings, £4770. The reserve fund amounted at the close of June to £36,480; and the insurance fund to £34,598. The following is the

REVENUE ACCOUNT.

Expenditure.

Manufacture of gas—		
Coal and oil, including dues, carriage, unloading, and trimming	£95,535 13 1	
Salaries of Engineer and officers at works	2,566 7 3	
Wages (carbonizing)	14,913 19 9	
Purification, including labour	1,330 6 8	
Repair and maintenance of works and plant, materials and labour, less £316 0s. 2d. received for old materials	24,392 19 7	
		£138,769 6 4
Profit sharing		2,811 2 9
Distribution of gas—		
Salaries and wages of officers (including rental clerks)	£4,465 12 7	
Repair, maintenance, and renewal of mains and services, material and labour	7,427 9 5	
Repair and renewal of meters	2 131 1 6	
,, ,, ,, ,, stoves	7,167 17 10	
,, ,, ,, ,, prepayment meters and fittings	10,051 19 11	
Incandescent mantle maintenance	544 0 5	
		31,788 1 8
Public lamps—lighting and repairing		2,3 9 4 11
Rent, rates, and taxes		12,910 5 3
Management—		
Directors' allowance	£1,250 0 0	
Company's Auditors	75 0 0	
Salaries of Secretary, Accountant, and clerks	1,289 6 9	
Collectors' salaries and commission	1,739 9 2	
Prepayment meter collection	2,730 6 7	
Stationery and printing	796 1 0	
General cbarges	1,916 10 10	
		9,796 14 4
Bad debts		737 14 3
Law and parliamentary charges		393 19 5
Superannuations and allowances		1,200 6 0
Official officers, &c.		144 6 4
Total expenditure		£200,891 1 3
Balance carried to net revenue account		63,922 8 7
		£264,813 9 10

Receipts.

Sale of gas—		
Common gas per meter at 2s. 6d. per 1000 cubic feet (95,019)	£193,618 12 5	
Public lighting and under contracts, common gas	5,672 5 2	
	£199,290 17 7	
Less discounts and allowances	3,810 6 11	
		£195,480 10 8
Rental—		
Meters (23,523)	£2,833 1 11	
Stoves (56,558)	9,053 6 4	
Prepayment meters (70,718)	11,907 3 11	
Incandescent mantle maintenance	556 2 0	
		24,349 14 2
Residual products—		
Coke, less £4294 13s. 2d. for labour	£26,179 14 9	
Breeze, less £1331 1s. 4d. for labour	1,835 6 2	
Tar	6,891 7 2	
Ammoniacal liquor and sulphate of ammonia	10,013 14 5	
		44,920 2 6
Miscellaneous receipts—		
Rent receivable	£28 7 6	
Transfer fees	34 15 0	
		63 2 6
Total receipts		£264,813 9 10

The following are the statements relating to the manufacturing operations of the Company in the half year:—

Statement of Coals and Oil.

Description of Coal.	In Store Dec. 31, 1908.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store June 30, 1909.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	25,259	106,598	101,426	572	29,859
Cannel	365	..	188	..	177
Total	25,624	106,598	101,614	572	30,036
Oil—gallons	366,925	1,228,810	1,198,601	..	397,134

Statement of Residual Products.

Description.	In Store Dec. 31, 1908.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1909.
Coke—tons	11,805	62,238	13,153	56,800	4,090
Breeze—tons	6,428	11,030	..	11,916	5,542
Tar—gallons	588,830	1,209,516	..	1,320,039	478,307
Ammoniacal liquor—butts of 108 gallons	6,458	34,046	33,202	..	7,302
Sulphate of ammonia—tons	250	1,054	..	1,224	80

Statement of Gas Made, Sold, &c.

Quantity Made (meter register and estimated).	Quantity Sold.		Quantity Accounted for.	Number of Public Lights.
	Public Ligbts and under Contracts (estimated).	Private Lights, per Meter.		
Thousands. 1,687,734	Thousands. 36,671	Thousands. 1,551,304	Thousands. 1,613,291	3921

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, oil, &c., £26,129; coke and breeze, £2738; tar, ammoniacal liquor, sulphate of ammonia, &c., £7418; sundry stores, £35,012—total, £71,297. The figures this time last year were: Coal, oil, &c., £25,534; coke and breeze, £4503; tar, ammoniacal liquor, sulphate of ammonia, &c., £7173; sundry stores, £34,996—total, £72,207. A sum of £19,126 stands in the balance-sheet as employees' bonus and savings, compared with £15,856 at the end of June, 1908.

PAST YEAR'S WORKING IN BELFAST.

At the Meeting of the Council of the County Borough of Belfast last Tuesday, Mr. J. A. Doran, in moving the adoption of the minutes of the Gas Committee, said the accounts of the gas undertaking for the year ended the 31st of March had been made up, and the result was as follows: The gross profit on the manufacture and sale of gas and residuals was £44,368. Deducting dividends and interest on capital, £9849, and the equivalent of interest on redeemed stock, £3457, there was a net profit of £31,062, against last year's £39,940, or a decrease of £8878. The balance brought forward was £10,293; and when they added the net profits of the current year, £31,062, and the profit on the stove repairs account, the total credit on the profit and loss account was £41,549. Out of this amount the following sums had been set aside: Sinking fund, £5698; and interest on the insurance suspense account, £660; leaving a balance of £35,191. Out of this sum the Committee had contributed the following amounts for public purposes: To the Finance Committee in aid of the rates, £15,000; dividends and sinking fund on new City Hall redeemable stock, £11,382; and Parks Committee for the band fund, £100; leaving a balance at the credit of the profit and loss account of £8708. The Committee had made their contracts for coal this year; and with reference to the contract for oil, the Engineer (Mr. R. Sharpe) deserved great credit, since there was a total saving of something like £12,000 on the buying of this commodity as compared with that day twelve months. He thought this was very creditable. He might add that the contract was entered into for two years, which was a wise step. The increase in the output of gas was upwards of 7 per cent., and something over 15 per cent. more than the past two years; so that they were doing pretty well. He had promised to put a statement before the Council in reference to the extension of the gas-works, and he could assure the members that it was not his fault it was not ready. The delay was caused by certain of the staff being away on holidays.

Mr. M'Cusker called attention to the coal contracts, and said if the Committee had accepted a proposal at 13s. 9d. per ton they would have saved the ratepayers £1500. He moved, as an amendment, that the question of the contracts be referred back to the Committee for reconsideration. Mr. Gregg seconded the amendment. Mr. Riddell said Mr. Sharpe assured the Committee that the 13s. 9d. coal was not equal to that which had now been ordered. Belfast was the most successful Municipality in the kingdom with regard to the manufacture of gas, and to their officers and the Manager was due the greater part of the success with which the coal was converted into gas. Therefore, when they reported on the quality of the coal, their opinion was accepted.

Mr. Squire said it was only by the practical experience of a lifetime that one could judge of the best coal. That at 14s. 4d. per ton would be really cheaper than the coal at 13s. 9d. They must trust the Manager and those in authority. On being put, the amendment was lost by a large majority; and the minutes were adopted.

GLASGOW CORPORATION GAS DEPARTMENT.

[From Our Own Correspondent.]

It had been known for some time that a big decrease in the output of gas in Glasgow had been experienced; but few, probably, were prepared to learn, as is now disclosed in the published accounts of the Gas Department, that it was so large as upwards of 285 million cubic feet—equal to nearly 4½ per cent. Where was the decrease experienced? In the analysis of gas consumption contained in the report of the Gas Committee, it is found that in ordinary lighting there was a reduced consumption amounting to 319,607,400 cubic feet, and if there is deducted from this figure the extra 34,772,193 cubic feet consumed through prepayment meters, nearly all of which would be used in lighting, there is still a drop of nearly 285 million cubic feet—all but equalling the total decrease for the year. The quantity of gas used in engines was less by more than 32 million cubic feet, notwithstanding the effort of the Corporation a year ago to secure an output for power by raising the differential rate as between lighting and power from 3d. to 4d. per 1000 cubic feet; and the circumstances would seem to point to the inroad which suction-gas plant is making upon town gas for power. Gas used for manufacturing purposes, with a differential rate of 3d., increased by upwards of 16 million cubic feet. In this branch of business the Gas Committee have abandoned the flat-rate, and have withdrawn the differential rate for quantities of less than 30,000 cubic feet, making the charge the same as for lighting; but they offer a differential rate of 4d. for quantities above 30,000 cubic feet. The temptation is here to offer the remark that it was scarcely worth while making the distinction, as the number of manufacturers who would use less than 30,000 cubic feet of gas per annum must be few. The Committee have introduced a new charge, for gas used in hotels, clubs, and institutions, for other than lighting purposes—making the prices the same as for manufacturing purposes, but with the dividing-line at 100,000 cubic feet. The purpose for which such gas will be used will be cooking and heating. The concession of 4d. per 1000 cubic feet will doubtless be appreciated; but here, again, it is difficult to understand why, when caterers were receiving benefit, the keepers of restaurants and tea-rooms, of which there are so many in the city, should be excluded. There is a very strong feeling in the Corporation against differential prices. It was only in 1902 that a beginning was made, in an allowance of 4d. for gas used for motive power. For manufacturing purposes a reduction of 1d. was granted in 1905; and now the Committee are going a step farther. The history of differential prices has been a gradual concession, dictated by experience; and probably the intention in this year's new proposals may be to feel the way, and that we may expect next year, when the promised and much-needed Consolidation Bill is promoted, that the Committee will be prepared to go farther than they have as yet gone. The proposal was made in the Council on Thursday that, instead of lowering the price of gas to consumers for lighting and domestic purposes, the Corporation should reduce the charge for that used for public lighting by 2d. per 1000 cubic feet. It was an unworthy proposal, and was properly rejected. At the most, it would only have meant that the Watching and Lighting Committee would have been able to save £3600 a year, which would not have gone very far in the direction of benefiting the public, compared with the reduction of 1d. per 1000 cubic feet for gas used for lighting and domestic purposes—a benefit to the amount of £25,000 or £26,000.

A deficit was anticipated of about £26,000; but it was not realized. All that the Gas Committee went behind in the year's working was about £9000. To this sum there has been added £5000 which has been allowed as a special depreciation upon the portions of the works and plant of the Busby Gas Company which were taken over by the Corporation. This was done to make the book value of the Busby works correspond with the value put upon them by Mr. A. Wilson, the Engineer. As the Corporation were in the position, a year ago, of having in hand a surplus of £35,000, they are still, after allowing the £14,000 of a deficit for the past year, £21,000 to the good, and with better prospects in the matter of coal. The coal bill last year was down by as much as £85,000. The average price per ton was 10s. 11d., compared with 12s. 4d. in the preceding year—a reduction of 1s. 5d. per ton; and it is now announced that the coal to be used this year has been bought at a reduction of 1s. per ton upon last year's price.

Gas Committee's Report and Annual Accounts.

The report of the Committee on Gas Supply to the Corporation of Glasgow, together with the accounts for the year from June 1, 1908, to May 31, 1909, was submitted to the Town Council on Thursday last. In the report, the Committee state that

The gross revenue amounts to		£864,210
and the gross expenditure to	£674,446	
to which is added depreciation written off capital assets	66,896	
		741,342
Balance carried to profit and loss account . . .		£122,868
The Committee had to meet the following requirements during the year:—		
(1) Annuities on stocks	£21,770	
(2) Contribution to Glasgow Corporation loans fund, in respect of Glasgow Corporation 3 per cent. stock redeemable in 1921, issued in lieu of converted gas annuities	7,812	
(3) Interest on borrowed money and redeemed loans	60,578	
(4) Sinking fund	46,725	
		136,885
Leaving a deficit on the year's operations of . . .		£14,017
The credit balance as carried forward last year amounted to		35,488
from which deduct the deficit shown above of . .		14,017
leaves to be carried to the credit of next year's profit and loss account the sum of		£21,471

The decreased revenue from the sale of gas is mainly accounted for by the reduction in the price of 3d. per 1000 cubic feet made last year, the fall in the consumption of gas, amounting to 4·41 per cent., consequent on the general depression of trade, and the more general use of incandescent burners.

The Committee regret that the market for residuals has been unfavourable to the Corporation during the past year. The consequent reduction of income from ammoniacal liquor and tar amounts to £17,080, and is to be attributed to the smaller quantity of coal carbonized, and a lesser price obtained per ton; the quantity carbonized during the past year being 681,071 tons, as compared with 738,701 tons for the preceding year, a decrease of 57,630 tons. The average price received per ton of coal carbonized this year was 3s. 4·821d., as compared with 3s. 7·268d. for the previous year, a decrease of 2·447d. per ton. The contract for the sale of the products at the Provan works and the lease of the chemical works there, have been continued to Messrs. Brotherton and Co., Limited, for a period of five years from June 30 last, at an increased price.

The net sum realized from the sale of coke this year amounts to £100,303; being £18,496 under that of the preceding year, which is due to the smaller quantity sold and a lower price per ton obtained. The quantity of coke sold last year was 280,116 tons, as compared with 315,396 tons for the previous year, a decrease of 35,280 tons. The average price received was 7s. 8·36d. per ton, compared with 8s. 2·13d. for the previous year, a decrease of 5·77d. per ton.

The Committee observe with pleasure the much greater quantity of gas made per ton of coal carbonized, which was 10,015 cubic feet, as compared with 9522 cubic feet for the preceding year, an increase of no less than 493 cubic feet per ton.

The Committee advertised for tenders for coal to be supplied during the coming year, and have concluded contracts for the whole quantity required at prices under those of last year.

The rate of interest payable to the Corporation loans fund in respect of money borrowed was £3 3s. per cent., compared with £3 5s. 9d. per cent. for the preceding year. The Committee applied £2399 of the amount at the credit of the sinking fund to the extinction of £830 of £9 per cent. and £160 of £6 15s. per cent. gas annuity stocks; and the annuities formerly payable upon these stocks now cease to be a charge upon the revenue of the department. There has also been redeemed during the year, by the application of moneys at the credit of the same fund, £4084 of Glasgow Corporation 3 per cent. stock, and a further amount of £55,575 of loans raised under the Glasgow Corporation Gas Act, 1869, the Glasgow Corporation (Sewage, &c.) Act, 1898, the Glasgow Corporation (Tramways and General) Order Confirmation Act, 1901, and the Glasgow Corporation Order Confirmation Act, 1905. The sum carried to the sinking fund for redemption of loans, and redemption or conversion of annuities, was £46,725, and the accumulations and interest during the year amounted to £16,686; making the total addition to sinking fund for the year £63,411. The sinking fund, with its accumulations, now stands at £795,219, of which there has been already applied in the redemption of borrowed money, £3 per cent. stock, and annuities £710,285; leaving still available for either of these purposes the sum of £84,934.

Having regard to the result of the year's operations now recorded, and to the coal required during next year having been contracted for on favourable terms, the Committee recommend that the charge to be made for gas be reduced 1d. per 1000 cubic feet, this reduction to take effect as from the date of the last survey, and the rates to be charged to be as follows:—

	Per 1000 Cubic Feet. s.	d.
I.—For lighting and domestic purposes, within the city and suburbs generally	2	0
II.—For motive power purposes, within the city and suburbs generally	1	8
III.—For manufacturing purposes, within the city and suburbs generally—		
For gas supplied in quantities of less than 30,000 cubic feet	2	0
For the excess beyond 30,000 cubic feet	1	8
IV.—For hotels, clubs, and institutions, other than for lighting purposes—		
For gas supplied of less than 100,000 cubic feet . .	2	0
For the excess beyond 100,000 cubic feet	1	8
(The above rates to be applicable only for gas consumed in one and the same premises; and such supply shall be measured by a separate meter.)		
V.—Within the Milngavie area of supply, referred to in the Glasgow Corporation (Gas, &c.) Order Confirmation Act, 1902, 1s. per 1000 cubic feet extra on the above-mentioned rates.		
VI.—Supply through prepayment meters	2	7

In the analysis of gas consumption (p. 401) will be observed the extra demand for gas on the prepayment system; the increased consumption being 34,772,193 cubic feet, or 13·23 per cent.

During the year, the Corporation acquired the gas mains, meters, and stoves of the Busby and District Gas Company, Limited, so far as these are situated within the parishes of Cathcart and Eastwood, at the price of £9000. The acquisition removes all opposition to the progress of the Gas Department in this district.

The number of gas-engines in use and the total horse power for this year and the preceding year are as follows:—

	Number.	Brake Horse Power.
May 31, 1908 . .	1,685	18,087
May 31, 1909 . .	1,690	19,003
Increase .	5 = 0·296 p. ct.	916 = 5·06 p. ct.

The works and mains have been maintained in an efficient condition during the year out of revenue. The greatest quantity of gas sent out during the year in 24 hours was 34,830,000 cubic feet. The maximum daily make was 31,210,000 cubic feet. The unaccounted-for gas during the year was 9·29 per cent., as compared with 7·97 per cent. the preceding year; the increase being due to the large decrease in the gas sold, and also to a difference in the dates of the survey of meters, compared with the previous year. Upwards of 20 miles of new mains have been laid during the year.

The following is an analysis of the sale of gas for the past year as compared with the sale for the previous year:—

—	Year 1907-8.			
	Rate per 1000 C. Ft.		Consumption.	
	s.	d.	Cubic Feet.	
I.—Within the city and suburbs generally:—				
(1) Lighting	2	1	23,098,500	
(2) Do.	2	4	4,971,288,200	4,994,386,700
(3) Gas-engines	1	9	7,708,700	
(4) Do.	2	0	348,783,500	356,492,200
(5) Manufacturing purposes .	1	9	1,800	
(6) Do. do. .	2	0	205,170,300	205,172,100
(7) Contract gas.	2	4		557,292,700
II.—Within the Milngavie area:—				
(8) Lighting	3	1	43,000	
(9) Do.	3	4	17,974,800	18,017,800
(10) Gas-engines	3	1		410,800
(11) Manufacturing purposes .	3	1		1,198,900
(12) Contract gas	3	4		1,564,125
III.—Prepayment supply . . .	2	6	110,364,600	
Do. . .	2	11	152,461,828	262,826,428
				6,397,361,753
Used at works				75,272,200
				6,472,633,953

—	Year 1908-9.			
	Rate per 1000 C. Ft.		Consumption.	
	s.	d.	Cubic Feet.	
I.—Within the city and suburbs generally:—				
(1) Lighting	2	4	21,266,800	
(2) Do.	2	1	4,663,552,000	4,684,818,800
(3) Gas-engines	2	0	7,473,900	
(4) Do.	1	9	316,823,000	324,296,900
(5) Manufacturing purposes .	—			
(6) Do. do. .	1	9		221,698,300
(7) Contract gas.	2	1		563,883,870
II.—Within the Milngavie area:—				
(8) Lighting	3	4	33,700	
(9) Do.	3	1	17,144,600	17,178,300
(10) Gas-engines	2	9		460,500
(11) Manufacturing purposes .	2	9		1,058,200
(12) Contract gas.	3	1		1,673,750
III.—Prepayment supply . . .	2	11	16,487,221	
Do. . .	2	8	281,111,400	297,598,621
				6,112,667,241
Used at works				74,346,200
				6,187,013,441

Decrease, 285,620,512 cubic feet = 4·41 per cent.

The number of ordinary meters in all on May 31 was 225,422, as compared with 227,503 for the preceding year—a decrease of 2081. The number of prepayment meters in use on May 31 last was 43,900, as compared with 35,466 for the preceding year, or an increase of 8434. During the year, 30,404 meters were repaired. The number of gas-stoves on hire as at May 31, 1909, was 48,548, as compared with 43,566 for the preceding year, an increase of 4982. At the same time, there were also 10,380 small stoves and grills let out free of charge, as compared with 5903—an increase of 4477. This substantial increase in the number of these gas-consuming appliances will require a larger supply of gas, and the department will accordingly benefit thereby. In addition, it will also tend to mitigate the smoke nuisance within the city. The number of gas heating and cooking appliances sold during the year was 2777.

In the capital account, stock capital has been reduced, by redemption and conversion, from £415,000, bearing annuities to the amount of £34,762, to £260,127, bearing annuities to the amount of £21,694. The loan capital authorized amounts to £4,200,000; but of this sum £1,400,000 is applicable to electric lighting. The total amount borrowed for gas purposes has been £1,344,815, all of which has been obtained from the Corporation loans fund at £3 3s. per cent. interest. There has been redeemed £525,185. For electricity purposes there has been borrowed £1,213,687, and redeemed £186,312. There are borrowing powers remaining to the amount of £930,000. The year's capital expenditure amounted to £35,512. Of this sum, £1139 was expended upon waggons and coke-screening plant for the Dawsholm works, £895 upon coke-screening plant, &c., for the Tradeston works, and £223 upon the Tradeston chemical works. The capital charge during the year for pipes and cost of laying was £16,738, for gas-meters £13,205, for gas-stoves £10,642. These sums make a capital outlay of £42,843; but there are deductions, in respect of properties sold or transferred, to the amount of £7531, leaving the net capital charge for the year at £35,512. The total sum stated in the general capital account is £2,459,310, made up of sums borrowed, and the £3 per cent. Corporation stock issued for the conversion of annuities, together with £611,646 of moneys paid out of the sinking fund for redemption of loans. The capital expenditure is stated at £2,410,367; leaving a balance at credit of £48,943. The outlay upon the Temple works (£233,573) has been reduced by allowances for depreciation—of which £2515 was applied last year—to £160,587. The outlay upon the Provan works has been reduced from £780,037 to £722,661; upon the Old Kilpatrick works, from £6852 to £1641; upon the Milngavie works, from £2579 to £953; upon the chemical works at Dawsholm, from £48,038 to £29,208; upon the chemical works at Tradeston, from £17,280 to £11,838; upon the chemical works at Provan, from £53,562 to £46,795; upon pipes and cost of laying, from £855,702 to £487,641; upon gas-meters, from £558,379 to £223,032; and upon gas-stoves, &c., from £173,130 to £64,347. There is a premium account to the amount of £174,311, which has been reduced to £135,065.

In the revenue account, the income is stated at £864,210, a decrease of £141,943. There was derived from the sale of gas £631,421, a decrease of £107,055. Coke realized £100,303, a decrease of £18,495; and ammoniacal liquor and tar, £119,654, a decrease of £17,080—the total decrease upon residual products being £35,576. On the expenditure side, 681,071 tons of coal cost £372,254, a decrease of £85,221. Purifying materials, and oil, water, and sundries at works cost £27,334, a decrease of £6732. Salaries of engineers, superintendents, and officers at works amounted to £4842, a decrease of £176; workmen's wages amounted to £60,168, a decrease of £6852; and the carting and stabling account amounted to £2742, a decrease of £128. The total expenditure upon the manufacture of gas was £541,388, a decrease of £101,787. The distribution of gas cost £64,126, a decrease of £6172; the stove and appliances account amounted to £11,479, a decrease of £3645; rents and feu duties amounted to £8416, a decrease of £1187; and rates, assessments, and taxes, upon a valuation of £136,736, which was £11,869 higher than a year before, amounted to £31,879, an increase of £3274. Management cost £15,246, an increase of £183; law charges amounted to £87, a decrease of £26; and parliamentary charges were £10, a decrease of £877. Depreciation was allowed for at the rate of 1½ per cent. on the gas-works, amounting to £22,063; at the rate of 3 per cent. on the chemical works, amounting to £2895; at the rate of 2 per cent. on pipes, amounting to £10,137; at the rate of 6 per cent. on meters, amounting to £15,137; at the rate of 10 per cent. on stoves, amounting to £7305; and at the rate of 2½ per cent. on premium, amounting to £4358. The total ordinary depreciation amounted to £61,896. In addition, there was a special depreciation allowed out of revenue, to the amount of £5000, upon the property acquired from the Busby and District Gas Company, Limited. The total sum on the expenditure side of the revenue account was £741,342, which left a balance, as stated previously, of £122,868.

The quantity of gas made at Provan amounted to 2,213,433,000 cubic feet; at Dawsholm, to 2,617,485,000 cubic feet; and at Tradeston, to 1,990,044,000 cubic feet. The total gas made amounted to 6,820,962,000 cubic feet; the gas sold or accounted for, to 6,187,013,441; and the gas unaccounted for, to 633,948,559 cubic feet—equal to 9·294 per cent.

Debate in the Council.

Bailie M. W. MONTGOMERY, the Convener of the Gas Committee, presented the report and accounts.

Mr. W. NELSON said that at a meeting of the Sub-Committee of the Gas Committee on Finance, on July 28, the minutes stated that the Treasurer submitted a statement showing the estimated revenue and expenditure for 1909-10 of the Gas Department, and that the Sub-Committee, having considered the same, and the draft of the annual accounts and balance-sheet of the Gas Department for the year to May 31, 1909, along with the draft of the annual report, approved of the annual accounts, and resolved to submit the same to the Gas Committee at their next meeting, but continued consideration of the report; and that at a meeting of the same Sub-Committee on July 30, it was stated that they "resumed consideration of the draft annual report to be submitted to the Gas Committee, and, having had again before them a revised estimate of revenue and expenditure for 1909-10, agreed to submit to the Gas Committee the report now adjusted." This revised estimate was not submitted to the Gas Committee; and he wished to know whether it was competent to discuss the accounts of the Gas Committee when such an important document as that had neither been before the parent Committee nor the Corporation. Standing Order No. 19 read: "A copy of the detailed annual accounts and estimates of each department shall be sent to each member of the Committee interested at least a week prior to the meeting of the Committee at which they fall to be considered."

Lord Provost M'INNES SHAW said this was an important point, and he would call upon the Town Clerk to deal with it.

The DEPUTY TOWN CLERK (Mr. J. Bowers) said that Mr. Nelson having notified him of his intention to put the question, he had looked into the matter. This was only the second year that the so-called estimate had been prepared by the Gas Treasurer for the information of the Finance Committee of the Gas Department. No copies of this estimate had ever been sent out to the members of the Finance Committee prior to the meeting at which the Committee had before them the draft report which formed part of, and was submitted to the Corporation along with, the annual accounts of the Gas Department. Copies of the estimate referred to had never been sent out to the Gas Committee previous to the meeting at which the Committee considered the report; and no mention of any such estimate was made in the minutes of the Gas Committee dealing with the report. He had carefully considered the provisions of Standing Order No. 19, and the provisions of the previous Standing Order which was superseded by the existing one; and he was of opinion that neither of these Standing Orders was ever meant to apply to any estimates of any department except those which had to lay on assessments. This was not an assessment department; and therefore Standing Order No. 19 did not apply to it.

Bailie MONTGOMERY then moved approval of the accounts. He said that gas was a commodity so much used by the community in one form or another—in lighting, in heating, or in cooking—that any particulars regarding the Department must be of more than passing interest to the great body of the citizens. The revenue of the department during the past year amounted to £864,210. This was a considerable decrease on the previous year. Their revenue, however, was a fluctuating quantity, varying from year to year according to the price of gas. As they reduced the price of gas last year 3d. per 1000 cubic feet, a decreased revenue was to be expected. There was also a falling off in the consumption of gas, amounting to 4·41 per cent., as compared with the preceding year. This was due to the dull trade which had prevailed; for it was quite natural that all people should try to economize in the

consumption of gas as well as in other directions. The revenue from residual products had also suffered from the same cause; there being a decrease of £35,000 under this head. The gross expenditure amounted to £674,445; and after adding depreciation, sinking fund, and other charges, there was a deficit on the year's operations of £14,000. This was not alarming, because last year they carried forward a balance of £35,000, and, owing to the reduction in the price of gas, they estimated that the accounts would show a deficiency of £26,000; so that, in reality, the year's working had turned out very much more favourably than the Committee had anticipated. Deducting the £14,000 deficit from the £35,000 balance from last year, there remained a balance of £21,000 to carry forward to next year's account. A very notable feature in the accounts was the quantity of gas produced per ton of coal carbonized; this being 10,015 cubic feet, as compared with 9522 cubic feet last year—an increase of no less than 493 cubic feet per ton. This gratifying result reflected very great credit on Mr. Wilson, the Station Managers, and the staff. Another interesting feature was the rapid development of the automatic meter. They had 43,900 of these in use on May 31 last, as compared with 35,466 for the preceding year, an increase of 8434. This showed that the introduction of these meters had met a very much felt want among the working classes. There was also an increase to the extent of 4982 in the number of cooking-stoves on hire. This department of their work came in for a good deal of criticism a few months ago; some members being of opinion that it should not be encouraged. He differed entirely from this opinion. He believed it was a department which they should try to develop. He thought the Gas Department should bring home to the public the advantage of gas for cooking and heating. It was cheap, convenient, and satisfactory in its results; and a greater use of these stoves would undoubtedly mitigate to some extent the smoky atmosphere of the city. They proposed this year to reduce the price of gas by 1d., making it 2s. per 1000 cubic feet—the lowest price at which they had ever supplied it. The reduction would be good news to the consumers. There never was a time when cheap commercial commodities were more needed than now; and with the reduction in the domestic water-rate, and in the gas, they hoped to lighten the burden on the ratepayers. He was sorry to notice that they had an amendment to this by Mr. Nelson, who was to propose that they should not reduce the price of gas this year to the general consumer, but that they should allow 2d. per 1000 cubic feet off for lighting. This involved a new and very important principle. The Corporation had resolved to apply in next session of Parliament for a consolidation of all their Gas Acts; and he was very strongly of opinion that the eve of their going to Parliament for such a purpose was a very inopportune time for departing from the lines which had governed the Gas Department since it was instituted. They were justified in making the reduction they proposed, as they were carrying forward £21,000, and had purchased their coal for the coming year at 1s. per ton less than last year, which gave them £35,000 or £40,000.

Bailie Paxton, the Sub-Convener, seconded.

Mr. Nelson said his difficulty was that, as a business man, he would have expected the Corporation to place before them data which would have enabled them to pass an intelligent judgment on the proposal which was before them. They were asked to accept what the Gas Committee had dictated to them, without any information being made available. When he entered the Council, his opinion was that if a question of rates and taxes came before them, full information should be obtained by every member. They had been told that they could not have the estimates, as they were merely rough ones. He held in his hands the estimates which were presented at the first meeting; and he thought he was entitled to refer to them. If not, then he would ask the Corporation to continue the consideration of the minute as a whole, until they had the figures properly before them, to enable them to deal with them. In the estimates, it was stated that the permanent officials of the Gas Department, having gone carefully into the cost of the gas supply for the current year, produced a statement to the Sub-Committee, in which they pointed out that, giving full value for the reduction in cost by reason of the cheaper coal this year, making reasonable allowance for maintenance and repairs to works and pipes, and for the outlay incurred during the recent winter for the benefit of the unemployed, making all reasonable provision for the current year's charges, and, on the other hand, after giving full credit for the estimated results from the sale of gas at last year's rate of 2s. 1d., and the price of residual products, there would be a deficiency of £607. This was the statement of the responsible officials who were managing the department. At the meeting, there was no proposal to reduce the price for domestic lighting; but the meeting practically dealt with the proposal to continue the price, because they did not see their way, with the burdens upon them, to make a reduction on this head, and they continued the proposals, with a view to obtaining the opinion of the Town Clerk as to whether they could make any reduction for power purposes, to hotels, and also as to whether they could do anything for the public lighting department of the city. At the meeting on July 30, called at less than 24 hours' notice, the whole matter was turned over; and it was proposed to reduce the rate for domestic purposes by 1d. per 1000 cubic feet. This meant between £25,000 and £26,000 loss by the concession of 1d. for domestic purposes. In other words, the proposal was to give gas to the citizens, and to people outside the city, at less than cost price. He objected to this; and he thought the better way of proceeding was as he proposed. He had every sympathy with the citizens, and would be glad to see them have gas at a reduced price, if they could possibly do so; but, as a business man, he said it was not a prudent course, in face of the figures submitted to them by their responsible officials, to give gas at less than they could produce it for. With regard to the proposal to make a reduction to the Public Lighting Department, the gas bill in respect of public lighting and stair lighting was about £47,000. The Manager indicated to them that, in instituting a comparison between the ordinary consumer and the city for public purposes, there was a distinct saving in the case of the city, in the cost of surveying and collecting, and also in maintenance—a saving representing 2d. per 1000 cubic feet. The Sub-Committee on July 28 were advised that it was quite within their power to make a reduction to the Public Lighting Department. He moved that no reduction be made in the price of gas for lighting and domestic purposes, and that the rate for public lighting be reduced to 1s. 11d. per 1000 cubic feet. This amendment was entirely in the interests of the citizens; and the Gas Committee should look at the matter in a reasonable spirit. There did not seem to him to be any reason why a small lodging-house keeper in the city should not get gas for power purposes at the same rate as the large hotel-keepers; and until the Gas Committee came to a resolution with regard to the gas as it was to be used for such purposes, he thought it was out of place for them to make the proposal they did.

Mr. A. M. Ure seconded. The citizens, he said, were not asking for a reduction in price. On the other hand, they had any number of complaints with regard to the lighting of the streets; and as the Watching and Lighting Committee were large consumers of gas, he thought they should receive a reduction. If the rate were reduced to them, the Watching and Lighting Committee might light the streets better. The people were leaving the city by thousands; and it was the duty of the Corporation to do what they could to retain them, by lightening the rates.

Baillie Guest agreed with the Convener that there should be a very good reason before they made any departure from their current policy. In what the Committee proposed, they were just doing what they had done all along—they were reducing the price of gas because they thought they could afford it. It might seem to some councillors that to make a concession for public lighting would be a greater concesssion to the citizens than would be a reduction for general lighting. He was very anxious to make a concession for public lighting; but if they did so, the same concession would require also to be given to every suburban authority. In making the proposals they did, the Gas Committee were actuated by a desire to get an increased demand for gas during the day. A lower rate for public lighting would not be at all likely to induce an increased demand during the day. The Committee, he believed, felt that the more they could do to give cheap gas for manufacturing and cooking purposes, the more likely they would be to induce an increased demand for gas during the day, and during the summer—thereby introducing a better system of operating their gas-works, and also helping to purify the atmosphere. He cordially supported the minutes. Like some members of the Council, he was at one time much dissatisfied that the figures were not given them on which they were to base their estimates for the ensuing year; and it was only after a rather strenuous effort that he got the Treasurer to put down the figures in black and white for their consideration. But there were many reasons why it was not desirable to bring the figures before the Council. He would also remind the Council that the Gas Committee had power to do business without coming before the Council.

Mr. J. Young described himself as one of the three renegades, and as being quite proud of the position he occupied. The Gas Committee manufactured a commodity which they were trying to sell; and he thought the largest consumer should be entitled to the best terms. This was the broad principle on which he went. He found that the streets of the city required to be better lighted, so that the citizens might have greater protection. If they were able to sell gas at 1s. 8d. to traders who did something with it, and made a profit, they should be prepared to sell it at the same figure to the Watching and Lighting Committee, who consumed over 500 million cubic feet annually, and who gave them large sums of money without any further effort than merely crossing the lobby to get a cheque. They were told that the Watching and Lighting Committee might tax the people for the lighting of the streets; but he thought the Gas Committee should make a concession to them in the matter of price; and they were only asking half the concession which was going to be granted to others. He was under the impression that the poorer class of the citizens would get greater benefit by having their rates reduced than they would by the small reduction of 1d. per 1000 cubic feet for gas.

Mr. P. G. Stewart said that in the old days a man in a single apartment had gas at the same rate as the man in a west-end flat, and he said they were going wrong altogether. Ever since Mr. Wilson was appointed, he had been trying to get a little on here, and a little on there. They had, at the present time, no less than 13 different rates; and if they agreed to the proposals of the Gas Committee, they would have no less than 33 different rates. He hoped the Council would send the minutes back to the Committee. What was the good of taking out of one pocket and putting into another? They had a surplus of £21,000; and they ought to hand it back to the consumers, by lowering the price of gas.

Bailie Russell considered it very extraordinary to hear any member of the Council objecting to the public getting the benefit of a reduction in the price of gas. He quite agreed with Mr. Nelson that they were, perhaps, sailing too close to the wind; but he thought they were justified in running the risk of having a small deficiency at the end of the year for the benefit of the community. The community sadly needed just now the benefit of this 1d. per 1000 cubic feet. He understood that to charge 1s. 11d. for public lighting would mean a cost to them of about £3600. The proposal of the Gas Committee gave the public lighting authority a reduction of £1800. A great deal had been made of the estimate which was laid before the Committee. In order that they might be able to form an opinion as to the business before them, a small jotting was made; and it should be destroyed after it had served its purpose. He hoped that the Council would adopt the Committee's recommendation.

Bailie Dunlop was entirely dissatisfied with the statements which had been made, and entirely at a loss to know where they were. The amendment he would move was that every member of the Corporation should be furnished with the estimate which was before the Committee on July 30, and that they continue the consideration of the accounts till the next meeting of the Council, for that purpose. They had no knowledge of the existence of such a document until they came there that day.

Mr. W. F. Anderson seconded. He did not think that any citizen would be found who would be willing to pay 1d. more per 1000 cubic feet for gas, in order to allow the Watching and Lighting Committee to reduce their rates; and he did not think that Mr. Nelson would be willing to give the benefit of the reduction to outlying districts. Surely the ratepayers of Glasgow, who were responsible for the gas undertaking, should be the first to get benefit. He absolutely disagreed with

the allocation proposed by the Committee. The big people, under it, were going to get all the benefit. If the Gas Committee sold 30,000 cubic feet of gas to a particular individual, he did not think it mattered very much to the Committee whether the person who was to use the gas baked scones with it or lighted the streets. If the proposal of the Committee were carried, and a consumer should find that he had consumed 29,500 cubic feet of gas, it would pay him to leave the gas burning all night, in order to get the reduction in price. He wanted to point out that when gas was used for manufacturing purposes, the cost of the gas was included in the cost of the article made. He thought the proposals of the Committee were not fair, and that differential rating should be put upon an intelligible basis. The time was when everyone paid the same for gas. Now the Gas Committee, he supposed, were going to give them a sort of "Chinese puzzle" in the matter of prices. He wanted to know why one should get any benefit over another.

The LORD PROVOST explained that by Act of Parliament they could not make a differential charge for lighting purposes to private users, but they could for public lighting.

Mr. T. CALDERWOOD pointed out that if they reduced the price of gas by 1d., everybody would participate in the benefit. He would have thought that everyone would have been glad of the proposal; but apparently the reverse was the case. He understood the question was going to be considered by the Gas Committee, probably within twelve months, when they came to the consolidation of their Acts of Parliament. He hoped the Committee, when they took up the question, would deal fairly with the Watching and Lighting Committee; but he did not think they should be spasmodic and jump to conclusions. If they could reduce the price of gas 1d. per 1000 cubic feet, he felt convinced they would do a thing which would be greatly appreciated.

Mr. J. WILLOCK considered it was all nonsense to say that the poor man was not getting the same chance as the rich man. All were to have the reduction. He pointed out that the Gas Committee had written £5000 off the value of the Busby Gas-Works, which could very well have been spread over ten years; but the Committee had thought it better to write this off at once. He had great sympathy with the Watching and Lighting Committee; but they should scarcely be mentioned, because, if the Council entertained the proposal with reference to public lighting, then Govan, and Partick, and other parts, would come in. Mr. Nelson's proposal would confer benefit on the community to the extent of about £3600; but the proposal of the Gas Committee would give them £25,000 or £26,000. Which of these sums were they going to have?

Deacon-Convener MACDONALD supported the amendment. It was a matter of indifference to him whether an outsider benefited or not. They visited outside people in their homes; and outside people visited them. There were plenty of people who did not use gas, but who paid very heavy rates. The streets should be lighted as cheaply as possible.

Dr. M'CONNELL considered that Mr. Anderson's argument all through was conclusive in favour of the minutes.

Mr. MACMILLAN held that the consumers of gas had a title to get any reduction which might be going. He also held that the community should get some reduction, in consideration of the very large quantity of gas which was consumed in the public lamps. It was proposed to give gas to hotel keepers at 1s. 8d. per 1000 cubic feet, on the ground that they would use the gas when others were not doing so. But the streets would be lighted for a great part of the time when nobody else was using gas. He thought that if the Convener took the minute back for further consideration, the Committee might see their way to make some little concession to the large consumers—the Watching and Lighting Committee and the other lighting authorities. He moved that the minute be taken back.

Mr. J. STEWART seconded.

Mr. S. MURRAY thought they had overlooked the difficulty there was in discussing the matter without prejudicing the very thing they were aiming at—the securing of a Consolidating Act. The Committee were anxious to have this Act passed; and under it the claims of all the consumers would be considered. They proposed this year to reduce the price of gas by 1d. all over. It was quite true that they were sailing close to the wind; but he belived they would get through without any serious deficit. Surely if ever there was a year in which they ought to stretch a point, and make a reduction for the benefit of the ratepayers generally, it was this year; and he sincerely hoped that the Council would pass the accounts, and allow the business to go on. They were practically agreed as to what was wanted; the question was how it was to be done.

Mr. NELSON intimated that, in view of the discussion which had taken place, his main purpose had been served, which was to call attention to the irregular form in which the accounts had been presented; and he was prepared to withdraw his amendment.

Bailie DUNLOP stated his agreement with a proposal of the Lord Provost that, if the Council should decide that the minute be taken back, the revised estimate should be furnished.

Bailie MONTGOMERY, in winding up the discussion, said it had ever been the habit of the Gas Committee to bring forward estimates to the Corporation; and this was the first time their practice had been questioned. The Gas Committee were exceedingly anxious to consider the matter of public lighting, which had been made the main objection that day; and if the Council passed the minutes, he hoped they would be in a position to deal with the consolidation of their Acts of Parliament without the prejudice which might ensue if the minutes were not passed. The present was a most inopportune time for dealing with the question which had been raised.

The Council then divided, when 34 voted for approval of the minute and adoption of the Committee's report and accounts, and 22 voted for the minute being sent back to the Committee.

Last Friday, Messrs. Allsopp's latest method of advertising their lager beer—a huge airship bearing these words—hovered over the town of Burton-on-Trent. The work of preparing the ship for flight commenced at six o'clock in the morning; the supply of gas for filling it being obtained direct from one of the mains of the Corporation. The quantity of gas used was about 7500 cubic feet; and about 2½ hours were occupied in the process.

STOCKPORT CORPORATION GAS UNDERTAKING.

Gas Engineer's Report—Appropriation of Profits.

At the Meeting of the Stockport Corporation last Wednesday, the report of the Gas Engineer and Manager (Mr. S. Meunier) was presented. It furnished the following particulars in regard to the working of the gas undertaking in the year ended the 31st of March last.

Mr. Meunier opened his report by expressing gratification at finding that, contrary to the experience of the large majority of Gas Departments throughout the country, the profits at Stockport, instead of showing a decrease, were actually much higher in amount last year, and once more constituted a record. In view of the prevailing bad trade, the higher price of coal, and the steady decline of the values of residuals, such an event was not foreseen, though the much improved results obtained by an addition to the carbonizing plant which was brought into full use during the year led to the hope that any reduction in profit would, at any rate, be largely minimized. The make of gas in the year showed the large increase of 1269 cubic feet per ton of coal carbonized. This not only materially reduced the amount of plant brought into use, but enabled an increased quantity of 15,197,000 cubic feet of gas to be produced over the year with a reduction of 3234 tons in coal and cannel carbonized—showing an actual saving in the cost of coal, though the price per ton of that used during the year was 11s. 8d., against 11s. 3·60d. for the previous year. There was an increase of £877 in the receipts for gas, and a decrease of £1413 in those from residuals, of which £1175 was on coke alone. The decrease would have been greater but for the fact that the quantity of ammoniacal liquor made per ton of coal carbonized showed an increase of 4½ gallons, equal to 3¼d. per ton of coal carbonized (apparently due to the addition to the plant previously referred to), and also that £597 was received for spent oxide—an item which does not appear in every year's accounts. The total income showed an increase of £149 14s. 3d.—*i.e.*, £116,810 4s. 11d., against £116,660 10s. 8d. recorded for the year 1907-8. Turning to the expenditure, the outstanding feature was the large reduction in the cost of manufacture, amounting for coal and carburetted water gas to no less than £4009, made up principally of coal, £3375; wages, £945; and oil, £517; the last being due to a somewhat improved contract. The reduction on coal was not due to lower prices, as the cost per ton used was practically 4½d. higher than in the previous year. The cost of the distribution of gas was reduced by £618, principally on maintenance of mains and services. How far this item had been effected by there being no cases of naphthalene, attention to which is charged to this account, could not, Mr. Meunier stated, very well be calculated; but the fact remained that, since the addition to the carbonizing plant previously mentioned, no signs of naphthalene had been observed in the district. This was very gratifying, as for a number of years the complaints arising from this trouble had been gradually increasing and becoming more serious—necessitating extra labour, at great expense, being employed to minimize inconvenience and loss to the consumers. The gross profit for the year was £40,381 5s. 11d., equal to 15·65 per cent. on the outstanding capital. This had been divided as follows: Interest, £8171; sinking fund, £10,182; stock redemption, £538; aid of rates, £15,000; reserve fund, £6490. From the reserve had been paid the following amounts: On conveyor plant, £1270; alterations to retort-house roof, £550 12s. 9d.; lighting outside Town Hall, £301 16s. 2d.; alterations to offices and show-room, £637 12s. 2d.

The tabulated statistics following the report show that 52,800 tons of coal and cannel and 535,205 gallons of oil were used in the production of 818,689,000 cubic feet of gas, of which 753,037,400 cubic feet were sold and 762,645,900 cubic feet accounted for. The residuals produced were: Coke, 28,748 tons; tar, 3758 tons; ammoniacal liquor, 8165 tons; and sulphocyanide of ammonia, 108,126 lbs. In the production of carburetted water gas, 5739 tons of coke were used.

The Mayor (Mr. J. Fernley), in moving the adoption of the report, said the financial results of the year's working were very gratifying. He wanted to see a net profit of £20,000, or double that made in 1906, when it was £10,158. In 1907, it was £17,412; in 1908, £19,070; and this year, £21,490. It was very gratifying to the Committee and the Manager that the results were so satisfactory; and he knew that it was so to the Chairman of the Finance Committee, who required as much money as possible if the rates were to be kept at the present figure. It would be equally appreciated, he trusted, by the ratepayers, who were the owners of the works, and had, as he had said on other occasions, a right to expect a fair return upon the undertaking. Of course, he quite expected that someone would say they ought not to make any profit, but should so reduce the price of gas as to give the consumers the whole benefit. This, however, was the opinion held by only a few members of the Council. It could not be said that, as a trading undertaking, the net profit was excessive, as this year it was 8·33 per cent., against 7·43 per cent. last year, on the loans outstanding—a dividend, however, which would not be despised by any investor. It might also be said that they had reduced the quality of the gas; but this was not so to any extent.

Mr. Hollis said he thought that out of £21,000 of profit something ought to be given to the consumers. Mr. Winter (the Vice-Chairman of the Gas Committee) said it would be impossible to reduce the price of gas. If he could see that a reduction in the charge to the ordinary consumers would benefit the town, he should certainly advocate it. A concession of 1d. to 17,000 consumers seemed to be a very small amount, but it would mean a difference of £2450 per annum; and if they were to make a reduction of 2d., it would cost the Corporation £4900. An additional 1d. discount to all other than automatic consumers would cost £2260, and 2d. would bring up the amount to £4500. If they were to make a reduction of 1d. per 1000 cubic feet for lighting purposes, the cost to the Committee would be £1930; while a reduction of 2d. would cost them £3860.

Alderman Bell hoped the Committee would not listen to the suggestions made that the price of gas should be reduced. He hoped they would be determined to give as large a sum in future for the relief of the rates as they had done in the past—even more, if they possibly could—and that the Council would back them up. Mr. Lees remarked that if the rates were to be kept low, they must get as large a profit as

they could from the receiving departments. He hoped the Gas Committee would not listen to the proposals for reducing the price of gas, but would endeavour to relieve the rates as much as possible, and so encourage manufacturers to settle in the town. Alderman Lees pointed out that the high price of gas would keep manufacturers away from the town just as high rates would. The profits from the gas-works were very substantial, and, in his opinion, they had arrived at a point when the consumer should be considered. Mr. Brewster also submitted that the consumers alone should benefit by the gas undertaking, and not the whole of the ratepayers, as many of the latter did not contribute to the profit realized.

In closing the discussion, the Mayor said the gas profits could not be said to be excessive, as they only represented 3 per cent. on the total amount of capital invested in the undertaking, and only 6 per cent. on the actual capital. If they reduced the price of gas, they would advance the rates; and therefore it was for the Council to decide which was the lesser of the two evils. So long as he was Chairman of the Gas Committee, he would always hold that a fair return ought to be made on the amount of capital expended. He would not waste his time on the undertaking if he did not see a satisfactory return. It was a commercial concern in which the ratepayers had invested their money; and they had a right to have a reasonable return.

CO-PARTNERSHIP AT GRANTHAM.

At the Seventieth Ordinary Half-Yearly General Meeting of the Grantham Gas Company last Tuesday, the Directors, in their report, stated that they had arranged a co-partnership scheme with the employees, under which the latter will receive a bonus out of the profits of the Company proportional to their salaries and wages and length of employment; and this incentive to good work and continuous service the men had accepted unanimously in a most hearty and cordial spirit of co-operation. The Directors had every hope that the scheme would prove in Grantham, as experienced by other companies, a means of promoting at the same time the welfare of the men and the interests of the Company. Referring to the working of the Company in the half year, they reported a balance of £3289 17s. 7d. to the credit of the profit and loss account, and they recommended that £2000 should be applied in payment of the maximum dividend of 5 per cent. per annum on the consolidated stock, that a further sum of £500 should be placed to the credit of the reserve fund, and that the balance should be carried forward. In accordance with an announcement already made, the price of gas to the ordinary consumer is reduced from 3s. 2d. to 2s. 11d. per 1000 cubic feet as from the 1st ult. In moving the adoption of the report, the Chairman (Mr. J. G. Thompson) referred to the co-partnership scheme, and said the Directors were giving proportional bonuses to the men according to the price of gas. This was now 2s. 11d. per 1000 cubic feet, and the men earned on this at present 5 per cent. If the price of gas went down, they would earn a better bonus; but if it went up they would have less. Mr. Cox seconded the motion, and it was carried.

AUTOMATIC LAMPLIGHTING AT SOUTHAMPTON.

At the Meeting of the Southampton Town Council last Wednesday, the Works Committee reported having considered a letter from Mr. P. W. Stephens, together with the observations of the Borough Engineer thereon, relative to the trial test of the Elton-Stephens gas-lighters; and it was proposed that, the agreement not having been fulfilled in accordance with the requirements of the Borough Engineer, Messrs. R. Stephens, Sons, and Co. be asked to remove the lighters. It was moved, as an amendment, to recommend that the lighters be allowed to remain, and be hired from the Company, in accordance with the terms of the contract. The amendment was carried; and it was also carried when put as a substantive motion. Alderman Hutchens, in moving the adoption of the Committee's report, said some eight or nine months ago the Committee recommended, and the Council agreed, that a number of automatic gas-lighters should be put in two lamp-lighters' sections. The conditions were to be that the failures were not to exceed 2 per cent. Observations were made by people from both the inventors who put the system in and the Borough Engineer's office; and at the termination of the test the Borough Engineer reported that it had failed. The Committee felt that some of the failures were not provided in the contract, and that they ought to give the inventors the opportunity of hiring-out the lighters for twelve months. The Corporation did not incur any responsibility beyond the hire, and they would have a saving of one lamplighter at £60 or £70 against the hire, which would be £36; so that there would be a distinct saving. Mr. F. J. Smith, in seconding the motion, stated that the number of failures which might be attributed to the burners was less than 2 per cent. The test was carried out at a period not to the advantage of the system, which was now going on satisfactorily. Sheriff Weston contended that the proper time to try the burners was in the winter. He put the question to the Borough Engineer as to whether or not he advised the Corporation to adopt the system, and he said he did not. He (the Sheriff) proposed, as an amendment, that, the agreement not having been fulfilled in accordance with the requirements of the Borough Engineer, Messrs. Stephens, Sons, and Co. be asked to remove the lighters. The amendment was carried on a show of hands.

A small fire occurred at the works of Mr. William Edgar, at Hammersmith, on Tuesday evening last; but, fortunately, it was confined to the laboratory and testing-room, and was discovered by the night watchman on his rounds. It appears that it had been smouldering for some time, but was put out by the use of the fire-pails which hang in several parts of the works, and also with wet sand from the foundry. It was subdued before the arrival of the fire-engine, but not before the photometer was destroyed. The fire will not interfere in any way with the execution of orders.

BOURNEMOUTH PUBLIC LIGHTING.

The Economy of Automatic Controllers.

The report of the Inspectors of Public Lighting at Bournemouth for the year ended the 31st of March last has just been issued; and it must be regarded as satisfactory, as showing an increase of work at a reduction of cost. From particulars published in a local paper, we learn that there are at the present time 2214 public incandescent gas-lamps in use, including the 42 larger lamps fitted with two burners in each, and the clock at a church near the Central Railway Station, the lighting of which is paid for by the town. During the year, 108 new lamps were fixed, and the position of 53 existing lamps altered; costing in all £508 1s. 8d. There are 1272 lamps fitted with the "Gunfire" automatic controllers for lighting and extinguishing the lamps. These are maintained, mantled, and cleaned under contract by the Company. The saving effected during the year by the use of the controllers, in gas, water, and maintenance, was £332 0s. 11d. The paper says: "One can hardly expect to find the answer in the report of the officials, but the question naturally suggests itself, if a saving of £332 can be effected by the use of controllers for rather more than one-half the lamps, why are not the remainder treated in the same way, and further saving obtained? This is a matter of policy for the Lighting Committee; but the lesson suggested by their own experience is so obvious that perhaps it is only fair to assume they are only waiting for the fitting opportunity to take the proper action." The total quantity of gas consumed during the past year was 19,531,181 cubic feet, costing £2507 0s. 9d.; being at the rate of 3s. per 1000 cubic feet, less 10 per cent. discount, to the end of September, 1908, and at the rate of 2s. 9d. per 1000 cubic feet, less 10 per cent., from that time to March 31, 1909. The amount saved by the reduction in price was £135 10s. 5d.; and £102 7s. 10d. of it was spent by the Committee in extra lighting—half-an-hour each night from Oct. 31, 1908, to March 31, 1909. The cost of lighting, extinguishing, cleaning, repairing, painting, and maintenance, including Inspectors' salaries, was £2201 2s. 11d. During the twelve months, the whole of the lamps were fitted with new metallic governors, effecting a saving of £182 17s. Taking 2107 as representing the average number of lamps for the twelve months, each lamp cost £2 5s. 7d., inclusive of all charges. In 1905-6, the total expenditure was £5689 18s. 6d.; in 1906-7, it was £5300 6s. 11d.; in 1907-8, £5537 9s. 10d.; and in 1908-9 it dropped, as already shown and from the causes indicated, to £5307 18s. 6d. This is exclusive of the electric lighting.

METER AND GAS TESTING IN EDINBURGH.

The Fourth Annual Report to the Lord Provost and Magistrates of Edinburgh by Mr. William Gordon, the Official Inspector, on the working of the Corporation Gas-Meter Testing Department for the year from May 16, 1908, to May 15, 1909, has been issued. It shows that the number of meters tested during the twelve months was 87,388—14,096 wet and 73,292 dry; and fees to the sum of £2410 were collected. During the year, a visit was paid by Major MacMahon, Deputy Warden of the Standards, who expressed his satisfaction at the equipment of the department, and also at the improvement in the situation of the new central office. The question of a separate test for gas-meter indices has been under the Inspector's notice for a considerable period. The subject is an important one, though it is undeniable that the extraordinary care now shown, and the accuracy attained, in the manufacture of gas-meter mechanism greatly minimizes the necessity for interference by the Legislature. In Edinburgh, the gas consumers have not manifested any anxiety to have the indices of their meters tested separately. The expenditure incurred in carrying out an index test would be very great, and the fees received quite inadequate to reimburse the department. The benefit gained by gas consumers—who would, of course, have to pay for the innovation—would be infinitesimal. It should be borne in mind by those who from time to time advocate the laying down of special plant for testing indices, that gas is the only illuminant supplied to consumers through instruments which are officially tested for accuracy of measurement under conditions as prescribed by Act of Parliament. The total number of meters tested by the department since its institution in 1861, up to and including the 15th of May last, amounts to 2,340,644; the fees received for the same period being £68,875. Figures are given showing the number of automatic meters, new and repaired, tested and examined during the twelve months. It is interesting to note that the output of coin-in-the-slot meters exceeds that of the ordinary type by 2407. This is a striking testimony to the popularity of the method of "selling gas by the pennyworth." The cash statement shows that there was a profit of £1019 on the year's work. Besides the central testing-station in the City Chambers, there are public testing-stations in other parts of Edinburgh. The staff employed is one Chief Inspector and six inspectors.

Of the 73,292 dry meters tested, 764, equal to 1·04 per cent., were rejected as incorrect. Of the 14,096 wet meters tested, 34, or 0·24 per cent., were rejected for a like reason. There were 80,533 meters of from one to five lights tested, at 6d. each; 6498 of from 10 to 60 lights, at 1s. each; 170 of 80 and 100 lights, at 2s. each; 58 at 3s.; 32 at 4s.; 38 at 5s.; 12 at 6s.; 15 at 7s.; 7 at 8s.; 5 at 9s.; 4 at 10s.; 6 at 12s.; 2 at 14s.; one at 15s.; 2 at 16s.; and one each at 18s., 20s., 25s., 30s., and 36s. The number of new automatic meters tested was 36,212, and of repaired meters 8213. The number of new ordinary meters tested was 33,805, and of those repaired 8277. The ordinary meters tested "for certificate" numbered 431.

As instructed by the Town Council, and in compliance with the Edinburgh and Leith Corporations Gas Order Confirmation Act, 1908, which authorized the installation of an official testing-station in the City Chambers, a 60-inch Letheby-Bunsen standard photometer was erected for the purpose of testing the illuminating power of the gas. The photometer room is 19 feet long, 12 feet wide, and 13 feet high; its capacity being 3087 cubic feet. The size of the apartment allows of good ventilation; and, owing to the system of heating, a fairly constant temperature can be maintained during testing operations. The

instrument is constructed to test burners up to 300-candle power; but with the aid of a Simmance-Abady "Flicker" head, and an arrangement which they have devised, they will be able to accurately determine the consumption and illuminating efficiency of any type of high-power burner which may be required in the Corporation properties where gas is consumed. On Monday, Dec. 21, 1908, the Edinburgh and Leith Gas Commissioners' Provisional Order was duly confirmed; and since that date the work of testing for illuminating power has been carried on continuously. The minimum is fixed by Statute at 14 candles, when measured with a "Metropolitan" No. 2 argand burner, consuming 5 cubic feet of gas per hour. The standard of light is a Harcourt 10-candle pentane lamp. As can be seen by the perusal of the weekly readings forwarded to the Town Clerk, the Inspector has carried out daily tests at various hours, chosen at his own discretion, and without any previous intimation to the Gas Commissioners of his intentions. From Dec. 22, 1908, to May 15, 1909, the average illuminating power of the gas, as read at the City Chambers, equalled 18·65 candles. All the tests were carried out under conditions prescribed by the Metropolitan Gas Referees.

THE EXPLOSION AT THE HANLEY GAS-WORKS.

Inquest on a Victim.

At the North Staffordshire Infirmary, Stoke-on-Trent, a few days ago, an inquest was held by Mr. Hugh W. Adams, County Coroner, in regard to the death of Patrick Sharkey, aged 62 years, who had succumbed to injuries sustained at an explosion at the Etruria works of the British Gaslight Company on the 19th ult., as recorded in the "JOURNAL" a fortnight ago (p. 267). Mr. J. R. Heath, the Engineer and Manager of the station, and Mr. E. A. Ashmall, solicitor, were present on behalf of the Company; Mr. J. A. Redgrave, one of the Superintending Inspectors of Factories, and Mr. Sydney Shuter, the Inspector for the Potteries district, were also present.

Michael Morgan, the purifier foreman at the works, stated that the accident happened about 7.30 in the morning. Deceased and several other men were engaged in emptying an oxide of iron purifier, measuring 40 ft. by 35 ft. The usual way of doing this was to take out the contents with spades; but sometimes picks were employed if the material was hard. On this particular occasion they were being used. All of a sudden there was an explosion—the only suggestion for which was that one of the picks had struck the side of the purifier, thus causing a spark. He at first shut off the gas, so that none could pass into the purifier. He had had 32 years' experience in this work. The purifier was last emptied in March, and was filled again. He was quite satisfied that there was not the slightest escape of gas. All the purifiers at the works were in the open air; and he had not known anything like this to happen before. The valves were in order, as far as he could see; and there was no leakage.

Asked if he had any suggestions to make, Mr. Redgrave said he did not know if Mr. Heath considered half-an-hour's exposure to the open, from the time of taking off the cover of the purifier to the time when the men entered it, was sufficient. Mr. Heath said he considered the exposure allowed for the clearing of the gas quite sufficient; and they followed the same course as that adopted all over the country. He further suggested that the probability was that a longer exposure would cause a larger quantity of air to mingle with the gas, and the mixture would then become more explosive. Mr. Redgrave remarked that in this case the purifiers were all out in the open air. He should not consider the time sufficient if they were confined in the old purifier-houses.

The Jury returned a verdict "That the death of the deceased Patrick Sharkey was due to shock following burns as the result of an explosion while emptying a purifier at the gas-works."

GAS v. ELECTRICITY IN FINCHLEY.

The District Council and the Local Government Board.

One of the Assistant Secretaries of the Local Government Board has written to the Finchley Urban District Council with respect to their application for sanction to a loan of £2200 for purposes of arc lighting. The Board referred the Council to their letter of Aug. 31, 1905, in which they suggested that, in connection with any future proposals for public lighting by electricity, the Council should carefully consider the cost as compared with that of lighting by gas, and inquired whether the suggestion was brought before the Council, and whether consideration was given to it before the present proposal was adopted. In conclusion, the Board asked for any reports made on the subject, and a copy of any estimate of the comparative cost of the two methods of lighting which may have been submitted to the Council or to the Highways and Lighting Committee. The Council directed the Clerk (Mr. E. H. Lister) to reply that the suggestion contained in the Board's letter of Aug. 31, 1905, was duly reported to the Finance Committee; and the result of its consideration by a Joint Committee of the Highways and Lighting Committee was a report which led the Council to decide to adhere to the electric lighting of the streets, where this was available, and in other cases to use incandescent gas. With regard to the present application, the Clerk said the Council had had under consideration the question of lighting the streets with gas, and, on the report of the Highways Committee, determined that they could not adopt a system of gas lighting in the roads specially indicated. The Board would therefore see that in 1905 and 1908 the Council had the question before them, and on both occasions decided that they could not adopt gas lighting for the streets. With regard to the last paragraph of the Board's letter, the Clerk said the Surveyor to the Council, at the request of the Highways Committee, asked the Manager of the North Middlesex Gas Company to supply him with an estimate for gas-lamps of the same candle power as the proposed arc lamps, or, if unable to do so, to submit an alternative suggestion for the lighting of the roads with such gas-lamps as they thought advisable; and he was informed that the Company were not prepared to supply an estimate simply to enable the Council to compare gas lighting with electricity. The Surveyor informed him that any such estimate would be fully and carefully considered by the Council. As to the question of the illuminant to be used for the streets, the Clerk said the Council considered they were the best judges of the matter, and did not feel that they could submit to any outside pressure to force upon them an illuminant of which they did not approve, and which, in their opinion, was not so satisfactory for the present purpose as the one they proposed. They respectfully submitted that the point the Board was called upon to decide was whether a loan should be granted for the necessary sum to enable arc lighting to be installed, and not as to whether gas or electricity should be used.

LIGHTING AND WATER SUPPLY OF DURHAM.

The First Annual General Meeting of the Institution of Municipal Engineers—the formation of which about a year ago was noticed in the "JOURNAL" at the time—was held in the Town Hall, Durham, last Saturday, under the presidency of Mr. JOHN T. PEGGE, the City Engineer and Surveyor, who read an interesting paper on the municipal history and works of Durham. We have received from the Secretary (Mr. B. Wyand) a print of the paper, and extract from it the portions of special interest to our readers.

Lighting.

The Coronation of George III. was celebrated by the inhabitants of the city placing rushlights and candles in their house windows; and these and the time-honoured lanthorn appear to have been the only means of illumination after sunset. Naturally the idle youth, vagrants, burglars, garotters, and other like evil-doers, must have had a rich harvest and happy time, if one judges from the local "Durham County Advertiser," from whose issues I have culled many facts. The Mayor of Durham held his court-leet and court-baron in 1814; and a public meeting was afterwards held to consider the riotous conduct in the Elvets, Baileys, and South Streets after dark. As a result of this, the Commissioners decided to put lamps in the streets. These were to be lighted from Sept. 21 to April 3, and provided with best whale oil and cotton wicks, to burn with a full, clear light from sunset to sunrise, except during the five nights before and two nights after each full moon. The lamps, however, were continually broken.

Early in 1823, a public meeting was held to take into consideration the lighting of the city and the borough of Framwellgate with coal gas; "and Mr. West (who has recently lighted Stockton, Richmond, &c.) is to carry out the intentions of the Commissioners before next winter." This was accomplished, for it is recorded on Jan. 2, 1824:

> The city was partially lighted by coal gas on Saturday and Sunday last, and wholly on Monday evening. The change which this substitute of gas for oil has effected is perfectly surprising, for we behold a city long notorious for its nocturnal darkness become at once perhaps one of the very best lighted towns in the kingdom. The street lamps are placed much nearer than is usual in most towns; and this, added to the brilliance of the lights, completely fills our narrow streets. A band of music paraded the streets, and the church bells rang a merry peal in compliment to Mr. West, who has at his sole expense erected the works, laid the pipes, and provided the lamps, engaging to light the town for the same sum that the lighting with oil has cost. The usual charge for gas in towns possessing local advantages as Durham is from £2 10s. to £2 12s. 6d. per lamp for the season; but Mr. West has contracted for less than £1 4s.—he supplying all pipes, pillars, services, &c., usually paid for by the Commissioners of other towns. Thus Durham has exchanged a light barely sufficient to render darkness visible for one of great beauty and brilliancy without having been at one farthing expense.

In 1841, the first Gas Company was formed; the undertaking being purchased from Mr. West by gentlemen who were all members of the Corporation, and the vendor quite expected it was being sold to the city. An opposition Company was commenced—the Coal Gas Consumers' Supply Company; but it was eventually merged in the above Company, and the whole concern transferred to the present Company in 1873. They extended the works and the area of supply, which is now as follows: Area of supply, about 33 square miles; houses supplied, 4507; gas made in 1908, 126,398,000 cubic feet; gas sold, 100,610,000 cubic feet. There is a special carburetted water-gas plant, by Messrs. Humphreys and Glasgow, of a capacity of 200,000 cubic feet per day. The price of gas is 2s. 9d. to 3s. per 1000 cubic feet, according to the quantity used. The Company can charge 1s. per 1000 feet extra for outer districts; but they only charge 3d. The greatest difficulty over practically the whole area is caused by subsidences due to colliery workings. The Company also have a sulphate of ammonia plant. At the end of 1908 there were 1148 gas cookers and heaters out on hire, notwithstanding the fact that so many residents have their coal supplied free. Up to the year 1902, the city had been lighted by flat-flame burners; one-half of the lamps being extinguished at midnight from October to April, and three-quarters extinguished altogether from May to August. The number of lamps was then 285 5-feet and ten 10-feet burners; and the amount paid per 5-feet lamp was £3 4s. per annum. The Company met us very fairly, and agreed to convert all lamps into incandescent-burner lamps within a stated time, and to provide all lighting and upkeep as before and mantles—the lamps to be all lighted throughout the year from sunset to sunrise (but one-half to be extinguished at 11.30 p.m.), at a cost of £3 0s. 6d. per lamp per annum. Including the newly-added area, there are now—

360 ordinary burners, consuming about 3½ cubic feet per hour, 60 to 80 yards apart	each	£3	0	9
10 four-burner lamps, special Welsbach . . .	each	16	10	0
2 public clocks	each	16	0	0
3 special single-burner high-pressure lamps in Market Place	each	16	18	0

These charges include all maintenance, attention, and replacements of every kind.

Early in 1901, the Council leased their powers for 21 years to the

Durham District Electricity Company, and this Company's interests were taken up by the County of Durham Electric Power Distribution Company, having their generating station at Carville-on-Tyne, near the source of the coal supply. There is a transforming station just outside the city on the north, from which the current is supplied to the Durham station. The pressure of supply in the city is on the three-wire system, at 240 volts for lighting and 480 volts for power; and all motors above 1 H.P. have to be connected across the outers. The number of connections to the Company's mains in Durham is about 500. The tariffs are—

Lighting, 3⅜d. per unit, less 5 per cent. discount.
Motive power, 1000 units per quarter . . . 1·50d. per unit.
Next 50,000 ,, ,, ,, . . . 1·25d. ,, ,,
,, 50,000 ,, ,, ,, . . . 1·00d. ,, ,,
,, 50,000 ,, ,, ,, . . . 0·75d. ,, ,,
Heating radiators, 1½d. per unit, if on separate circuit and meter.

Water Supply.

A supply of water was put into the Market Place in 1450; the pipes being in 3-feet lengths, seamed, butt-jointed, and burnt and tafted ends; the lead used being virgin lead, containing silver, from the Bishop's mines in Weardale, some of which are unearthed from time to time. In 1818, the water supply in the Market Place being bad, and the fountain and its pipes being out of working order, it was proposed to fix two pumps on each of the two bridges "where the public could get pure and wholesome water." Considering that some 25 to 30 old stone drains and sewers emptied into the river above these points, probably the townspeople thought quite otherwise. Colliery workings, various sources of pollution, the gradual filling-up of graveyards, &c., notwithstanding, these supplies continued in use till 1844, when the Durham Water Company erected works just outside the south-east corner of the city, with pumps and a service reservoir on Mountjoy Hill near. The city received a supply of filtered river water until 1880; Messrs. T. & C. Hawksley being the Consulting Engineers. The Company was taken over by the Weardale and Shildon (now the Weardale and Consett) Water Company, for whom the firm still act in a consultative capacity.* The Durham area of supply is, roughly speaking, somewhere about 50 square miles, with a total population of 100,000 persons. There are no great difficulties of supply except those due to colliery workings, subsidences, and occasional anxiety owing to districts being isolated. But repairs can now be done under pressure; and, owing to the system of duplicate pipe-lines, most of the districts are not without water for long. The consumption for domestic purposes is about 10 gallons per head. The water charges are 7½ per cent. on the rack-rents, and 7d. to 2s. per 1000 gallons through meter, according to the quantity used; baths and water-closets being charged for in addition. The highest pressure in the city is 160 lbs.; the lowest, 30 lbs. This constant and cheap supply of a soft, pure water, though of a slightly peaty colour, has an important bearing on the health of the inhabitants, most of whom are underground workers.

* A description of the Company's works, by the Engineer (Mr. R. Askwith, M.Inst.C.E.), prepared for the recent visit of the Association of Water Engineers, will be found in the "JOURNAL" for June 15 (p. 725).—ED. J.G.L.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual accounts of the Glasgow Corporation Gas Department were submitted to the Town Council on Thursday, and were adopted, though not without opposition. They show a considerable decline in business, which is attributed by the Gas Committee to depression in trade and the more general use of incandescent burners. With the second of these reasons I am disposed to agree; but not with the first. That the general use of the incandescent burner is limiting the demand for gas there can be no doubt; and no one grudges that it should be so, because of the stability which such a tendency gives to the business of gas supply. As to depression in trade, the expression is one which is easily spoken; but where is the evidence of it? Depression in trade, to have affected the gas business, would mean inability on the part of the people to pay. What I find, however, is that gas consumers in Glasgow have paid their bills better last year than they did the year before. The sum of gas-rents to be recovered at present is stated at £92,654, which is £22,881 less than it was a year ago. There are other reasons, of a more permanent nature, which affect the demand for gas, and not only the demand for gas, but the general wellbeing of many citizens. One is the rapid extinction of the small shopkeeper class, who are being ousted by co-operative and other large commercial establishments, whereby economy in the distribution of commodities is effected. There is another reason, which is more particular to Glasgow, and which was referred to in the Town Council in the statement that thousands were leaving the city. The meaning of this expression was that, with the cheapened facilities for transit which are provided by the tramway service, thousands of citizens are making their residences outside the city, where taxation is lighter. The week-end railway services are also responsible for a large decrease in the demand for gas; there being now many dwellings in which no light is required upon the Saturday and Sunday evenings. There is, of course, to be set against these causes of decline the natural growth of the city, which may be relied upon, in general, to counteract the contrary influences. The reflection naturally comes up that it is time the Gas Committee were applying their minds to the problem of extending the area of the gas supply, so as to include as much as possible of the districts favoured by tramway travellers, which, if legislation were necessary, might be made part of the Bill that is proposed for next year. We sometimes hear reductions in the price of gas lauded on the ground that they mean a gift to the community of so many thousand pounds. So they are; and in the same light, when it is considered that the revenue of the Gas Department was less than it was a year ago by over £140,000, it may be said that

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 372.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest-ment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17¾—18¼	..	5 9 7
298,955	10	,,	7	Do. 7 p.c.	12½—13	..	5 7 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd..	5⅝—5⅞	..	5 10 8
40,000	5	,,	6½	Do. New, £4 paid	4⅜—4⅝	..	5 12 5
50,000	10	Feb. 25	14	Bournemouth Gas and Water 10 p.c.	28¾—29¼	..	4 15 9
51,810	10	,,	7	Do. B 7 p.c.	16¾—17¼	..	4 1 2
53,200	10	,,	6	Do. Pref. 6 p.c.	15⅝—15⅞	..	3 15 7
380,000	Stk.	,,	12½	Brentford Consolidated	254—257	..	4 17 3
300,000	,,	,,	9½	Do. New	195—197	..	4 16 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
206,250	,,	June 11	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
220,000	Stk.	Mar. 12	10¾	Brighton & Hove Orig.	212—214	..	5 0 6
246,320	,,	,,	7¾	Do. A Ord. Stk.	154—156	..	4 19 4
460,000	20	Apl. 16	10	British	43—43½	..	4 11 11
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c.	119—121	..	4 19 2
165,700	,,	,,	4½	Do. B 3½ p.c.	89—91	..	4 18 11
82,278	,,	,,	5½	Do. C 5 p.c.	108—110	..	5 0 0
5[illegible],000	,,	June 25	3½	Do. 3½ p.c. Deb.	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13½—14	..	5 0 0
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,493,280	Stk.	Mar. 12	5 2/10	Commercial 4 p.c. Stk.	108—110	..	4 14 6
560,000	,,	,,	5	Do. 3½ p.c. do.	104—106	..	4 14 4
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	96—98	..	5 2 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
492,270	Stk.	—	5	Derby Con. Stk.	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord.	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd.	24¼—24¾	..	4 17 0
354,060	10	,,	12	Do. £7 10s. paid.	18¼—18¾	..	4 16 0
15,141,545	Stk.	Feb. 11	4⅔†	Gas Light and Coke 4 p.c. Ord.	105—106	+¾	4 8 0
2,600,000	,,	,,	3½	Do. 3½ p.c. max.	88—90	..	3 17 9
3,799,735	,,		4	Do. 4 p.c. Con. Pref.	105—107	..	3 14 9
4,193,975	,,	June 11	3	Do. 3 p.c. Con. Deb.	85½—86½	..	3 9 4
258,740	Stk.	Mar. 12	[illegible]¾	Hastings & St. L. 3½ p.c.	93—95	..	5 0 0
82,500	,,	,,	6¼	Do. do. 5 p.c.	118—120	..	5 4 2
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17¾—18¼	+¼	6 0 7
123,5[illegible]0	Stk.	Mar. 12	6½	Ilford A and C	141—143	..	4 10 11
65,780	,,	,,	5	Do. B	106—108	..	4 12 7
63,000	,,	June 25	4	Do. 4 p.c. Deb.	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental	179—181	..	4 8 5
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest-ment.
£			p.c.				£ s. d.
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	120—122	..	4 18 4
561,000	Stk.	Feb. 25	10	Liverpool United A	226—228	..	4 7 9
718,100	,,	,,	7	Do. B	168—170	..	4 2 4
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean	4⅞—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met. of Melbourne 5 p.c. Deb.	101—103	+1	4 17 1
250,000	100	,,	4½	Do. 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	May 27	3½	Monte Video Ltd.	12½—13	..	5 7 8
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	105½—106½*	..	4 4 6
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	91—93	..	3 15 3
15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½—20	..	5 0 0
55,940	10	,,	7	Do. 7 p.c.	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	137—139	..	5 15 1
60,000	5	Mar. 31	8	Ottoman, Ltd.	6⅛—6⅜	..	6 5 6
31,800	53	Feb. 25	13	Portsea Island A.	140—142	..	4 16 11
60,000	50	,,	13	Do. B.	132—134	..	4 17 0
100,000	50	,,	12	Do. C.	123—125	..	4 16 0
114,800	50	,,	10	Do. D and E.	103—105	..	4 15 3
398,490	5	May 13	7	Primitiva Ord.	7—7¼	+⅛	4 16 7
796,[illegible]80	5	July 29	5	Do. 5 p.c. Pref.	5¼—5½*	..	4 10 10
488,900	100	June 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
1,[illegible]00,000	10	Apl. 29	8	River Plate Ord.	16¾—17¼	+1	4 12 9
312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd.	14—14½	..	5 10 4
62,500	10	,,	6	Do. 6 p.c. Pref.	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49½—50½	..	4 19 0
135,000	Stk.	Mar. 12	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	233—235	..	4 5 1
523,500	,,	,,	10	Do. C	233—235	..	4 5 1
70,000	10	June 11	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	121—123	−1	4 6 8
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	84½—85½	..	3 10 2
209,820	Stk.	Mar. 12	8	South Shields Con. Stk.	153—155	..	5 3 3
605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	120—122	..	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord.	110—112	..	4 9 3
120,000	Stk.	Feb. 25	6⅞†	Tottenham and Edmonton A 5 p.c.	132—134	..	5 2 7
453,940	,,	,,	5⅜†	Do. B 3½ p.c.	111—113	..	4 15 1
149,470	,,	June 25	4	Do. 4 p.c. Deb.	100—102	+1	3 18 5
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	111—113	..	4 8 6
255,636	Stk.	Feb. 25	6½	Wandsworth B 3½ p.c.	139—141	..	4 12 2
79,416	,,	June 25	3	Do. 3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	,,	Feb. 25	5⅜†	West Ham 5 p.c. Ord.	125—127	+2	4 4 8
210,000	,,	,,	5	Do. 5 p.c. Pref.	120—128	..	3 18 2
253,300	,,	June 25	4	Do. 4 p.c. Deb. Stk.	105—107	..	3 14 9

Prices marked * are "Ex div." † Next dividend will be at this rate.

this money, being left in the pockets of the citizens, meant a gift of this amount to them. Yet the citizens never felt that they were receiving such a gift. This brings out the paltry nature of the opposition to the accounts, the foundation for which was a desire to gain £3600 for the public lighting—an irregular method of subsidizing the rates. A good deal was said in the discussion upon the accounts about irregularities on the part of the Gas Committee; but this was merely a side issue attached to the main issue for the purpose of catching votes. The Council would not listen to the special pleadings of the critics, notwithstanding that they had support in high quarters, but adopted the accounts straight off. Not only the Council, but the citizens are satisfied that the Gas Department is being well conducted, and conducted in the interests of all. For proof of this, there is need to go no further than to point to the price of gas, which, with the reduction to 2s. per 1000 cubic feet now made, is being sold at a lower figure than it has ever yet been; and there is every prospect, now that cheap coal has been, it may be assumed, assured for some years, that the low price will be a maintainable one.

The gas transfer at Carnoustie is being proceeded with in an exceedingly methodical manner. In the "JOURNAL" for July 20, it was stated in these "Notes" that a conference had taken place between representatives of the Gas Company, the Town Council, and the ratepayers—the last named having been appointed at a public meeting; and that at the conference the representatives of the Town Council agreed that they would recommend that £19,000 be offered for the Company's undertaking. A week later, it was stated that the Town Council ratified this recommendation. Now it falls to me to report that on Thursday evening the representatives of the ratepayers met their constituents in public meeting to give an account of what they had done. Ex-Bailie Ferrier, who was called to the chair, expressed himself as not clear in his own mind whether the community should acquire the gas-works or not, unless they could get them at what he would call a reasonable figure. It was an important question for the burgh, because, if they made a mistake at this stage, it would mean a pretty heavy burden for years to come. The three representatives of the ratepayers then stated their views. Mr. J. Nicoll severely criticized the report made by Mr. A. Silverthorne (who recommended the Town Council to offer £16,000 for the undertaking). Mr. Nicoll said that he had visited the gas-works, and they were not a "rotten show," as they had been described (he did not say by Mr. Silverthorne), but were a "splendid show." He had good grounds for his view that the Town Council should offer £20,000, which he considered a fair sum. Mr. R. Matthewson, another representative, considered that Mr. Silverthorne had made an under-estimate throughout, and had put the matter before the ratepayers in such a manner that no right-thinking or fair-minded body of men, such as the Gas Directors, would agree to discuss it. He himself had gone over the gas-works, and they could produce gas, after a period of ten years, at the same price, or at an equal price, to that charged by the Company, even although the Town Council paid up to £21,000. Ex-Provost Soutar, on behalf of the Town Council, upheld the report of Mr. Silverthorne as an honest, straightforward statement, and as having nothing false in it. The Chairman said his original idea was that the purchase price should be £19,000; but Mr. Nicoll had gone into the matter so thoroughly that he had brought him round to his figure as being a fair and reasonable sum. Mr. A. Duncan said he was prepared to move that the meeting agree to the sum of £20,000 as the purchase price; but he thought the more practical way was to take a plebiscite of the people themselves. He accordingly moved that the necessary requisition be got up and presented to the Town Council, asking for a plebiscite to be taken. This was unanimously agreed to; and the ratepayers' representatives were thanked for their reports.

At a special meeting of the Inverness Town Council held last week for the consideration of the estimates of revenue and expenditure for the year, Treasurer Duncan Macpherson said that the Finance Committee agreed to the recommendation of the Gas-Works Committee that those who used prepayment meters should in future be supplied with gas at the same rate as other consumers, which, it was expected, would entail a loss of about £200. The estimated revenue was £17,165, and the estimated expenditure, £17,860, which would leave a deficit of £695, all of which is to be made good out of the surplus fund at the credit of the profit and loss account.

Birnam having been declared, by decision of the Sheriff of Perthshire, a special lighting district, the first meeting of the Committee in charge was held last Saturday. The Clerk reported that they were too late for the imposition of a rate for last year. Letters from the former private Lighting Committee were submitted, in which they handed over the street-lamps to the Committee. Arrangements were approved for the placing of 11 old and 15 new lamps, at a cost of £100—an expenditure which it was resolved to spread over three years. The annual cost of lighting is estimated at £40. The Committee agreed to impose a rate of 5d. in the pound, which will realize £86. It is intended that the Dunkeld Gas Company will erect the lamps; and the Committee understand that the former annual charge of 17s. 6d. per lamp will be continued.

The annual meeting of the Crieff Gaslight Company, Limited, was held last week—Dr. T. H. Meikle presiding. A dividend of 7½ per cent. was declared (the same as for the previous year); and it was resolved to continue the price at 3s. 9d. per 1000 cubic feet. There has been a considerable increase in the consumption of gas during the past year, following the supplying and fitting up, by the Company, of 906 gas-cooking appliances.

An explosion of gas of a nature which it is surprising there are not more of occurred in an unoccupied house at 83, Taylor Street, in the Townhead district of Glasgow, last Sunday evening. The house is on the ground floor, and adjoins the premises of a licensed grocer. Two constables, surmising that there were burglars in the house, entered it. One of them turned his lantern on in the passage, when there was a violent explosion, which severely burned one of the policemen, and blew out all the windows of the house and the street door off its hinges. No one was found on the premises; but it was evident that an attempt had

been made to break through the wall into the grocer's shop. In this attempt a gas-pipe had been cut, which probably led the housebreakers to cease their work and retire before the police arrived.

In the Grangemouth Town Council on Monday, the Burgh Chamberlain submitted his annual statement regarding the finances of the Corporation. Dealing with the Gas Department, it was stated that the revenue for the past year was £6454, against which there was an outlay of £6578, which included a contribution of £800 to the sinking fund. It would be necessary to encroach on the surplus from the previous year to the extent of £124. The reduced contract price for coal, it was considered, may provide sufficient margin to meet the expenditure during the current year; but, in the opinion of the Chamberlain, it was obvious that the price of gas could not be lowered at present. The Chamberlain's statement of accounts was approved, and authority given to sign it.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 7.

Sulphate of Ammonia.

There has been no new feature in the market upon which to comment. Demand has been fairly steady, and, production being now at its minimum, prices have been about maintained. The closing quotations are £11 1s. 3d. per ton f.o.b. Hull, £11 3s. 9d. per ton f.o.b. Liverpool, and £11 5s. per ton f.o.b. Leith. Some business is being done over near months at but a slight premium on spot prices; but for delivery farther ahead the prices required by makers are not obtainable. For August-December £11 7s. 6d., for October-March £11 10s., and for January-June £11 12s. 6d. per ton are the quotations.

Nitrate of Soda.

This article continues very quiet; but the quotations are unchanged at 9s. 9d. per cwt. for ordinary, and 10s. for refined quality, less 2½ per cent.

LONDON, *Aug.* 9.

Tar Products.

The markets for tar products remain practically without change. Pitch is firm, and rather better prices are reported to have been paid for forward delivery. Benzols are steady, with a fair demand for 90's. Toluol is firm; but there are no fresh inquiries. Crude carbolic is decidedly easy, and Continental buyers report having purchased at 10¾d. to 11d. Creosote is steady; but not many fresh sales are reported.

The average values during the week were: Tar, 16s. to 20s. Pitch, London, 29s. to 29s. 6d.; east coast, 28s. 9d. to 29s. 3d.; west coast, 28s. 3d. to 29s. 3d. f.a.s. Mersey ports, 28s. to 28s. 6d. f.o.b. other ports. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 6d. to 6¼d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6¾d. to 7d. Toluol, casks included, London, 8¼d. to 8½d.; North, 7¾d. to 8d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3⅛d.; solvent naphtha, casks included, London, 10¾d. to 11d.; North, 9¾d. to 10d.; heavy naphtha, casks included, London, 10½d. to 10¾d.; North, 9½d. to 9¾d. Creosote, in bulk, London, 2¾d. to $2\frac{13}{16}$d.; North, 2½d. to 2¾d. Heavy oils, in bulk, 2⅞d. to 3d. Carbolic acid, 60 per cent., casks included, east coast, 10¾d. to 11d.; west coast, 10¼d. to 10¾d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is quiet, and very little fresh inquiry is reported from any quarter. Beckton prompt is £11 7s. 6d., and ordinary makes on Beckton terms are about £10 18s. 9d. to £11. In Hull, the price is £10 18s. 9d. to £11; and in Liverpool, £11 2s. 6d. In Leith, £11 5s. to £11 6s. 3d. is quoted.

COAL TRADE REPORTS.

Northern Coal Trade.

There is now a general return to normal conditions in the Northern coal trade, though there is still some limitation of the production through local strikes. In the steam coal branch, the demand is fairly good; but for best kinds, there is some scarcity, owing to one of the chief collieries having been idle some days. Best Northumbrian steams are now quoted from 12s. 9d. to 13s. per ton f.o.b., second-class steams are 11s., and steam smalls are steady at from 5s. 3d. to 6s. 3d. Exports are fairly good; but the slight interruption above referred to influences the quantities sent from some of the ports. In the gas coal trade, the demand is full especially for best sorts, and there is some pressure for these classes for the Mediterranean ports. Durham gas coals vary in price from about 10s. to 11s. per ton f.o.b., for the usual classes, and up to 11s. 6d. for "Wear specials." A contract for 16,000 tons for Magona is reported—the price being stated as about 16s. 6d., delivered at Porto Vecchio. The collieries appear to have their output well taken up, though some of the gas companies have added to their stocks of late. There is a steady demand for coke; and good gas coke is from about 12s. 9d. to 13s. per ton f.o.b. in the Tyne—the production showing some increase.

Scotch Coal Trade.

By the settlement of the dispute in the coal trade, a great impetus will be given to trade, though in many individual instances doubtless speculators will be hardly hit by the prices not going up. The trade was so disorganized by anticipation of a strike that it will take some time before it settles down. Prices are expected to fall lower than they are; and this expectation, coupled with the fact that large stocks have been laid in, has a restrictive effect upon buying. The prices are: Ell 10s. 6d. to 11s. 3d., splint 11s. to 11s. 3d., and steam 9s. 3d.

to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 213,026 tons, an increase of 29,423 tons upon the previous week, but a decrease of 26,442 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,469,076 tons—an increase of 569,121 tons.

Torquay Water Supply.—The annual inspection of the watershed and storage reservoirs of the Torquay Corporation was made by the Mayor and other members of the Corporation and several officials a few days ago. The watershed, about 2250 acres in extent, cost between £50,000 and £60,000; and the cultivated portion of it is about 300 acres. The total cost of the water-works, since their inception just over fifty years ago, has been about £250,000. The places supplied are Torquay, St. Mary Church and Cockington, Newton Abbot, Kingskerswell, Abbotskerswell, and Chudleigh. The day's arrangements were carried out by Mr. T. H. Wills, the Chairman of the Water Committee, and Mr. S. C. Chapman, the Water Engineer.

Glamorgan Water Supply.—In view of the rejection of the Glamorgan Water Bill by the Committee of the House of Lords, one of the undertakings which the proposed Water Board had agreed to purchase in the event of the Bill passing—viz., that of the Pontypridd Water Company—will probably be acquired by two local Councils. The figure originally agreed upon was approximately £330,000 for the existing works and the powers obtained by the Company for carrying out the Llia scheme; and it is reported locally that a Bill shall be promoted next session by the Rhondda and Pontypridd Councils to acquire the undertaking on these terms. A provisional agreement to this effect was come to between the two Councils in the event of the Water Bill being thrown out.

Bradford Water Supply.—The balance-sheet of the Bradford City Treasurer (Mr. G. A. Thorpe) dealing with the operations of the water undertaking for the twelve months to March 31 last, shows a net profit on the year's working of £8576. This sum is £6150 less than the profit made in the preceding year—a fact which is partly due to a reduction of income by the sum of £1146, as a consequence of the decrease of water for industrial purposes, and partly to the cost of the repairs necessitated by the great cloud-burst at Barden last year. The year's profits will reduce the deficit on the undertaking—which two years ago stood at £25,480—to the sum of only £2177. The Nidd Valley Light Railway shows a deficit on the year's working of £2234. Apart from interest, sinking-fund, and depreciation, the working of the railway resulted in a gross profit of £536.

New Water-Works for Raunds.—The completion of a scheme of water supply for Raunds has lately been celebrated. The reservoir, which has a capacity of 255,000 gallons, is situated about a mile from the pumping-station in the town. The Surveyor and Water Engineer of the Urban District Council (Mr. T. Yorke) presented the Chairman (Mr. J. Shelmerdine, J.P.) with a silver key, suitably inscribed, with which the door of the pumping-station was unlocked, and the company viewed the engines, pumps, gas plant, &c.; the necessary particulars being supplied by Mr. Yorke. Mr. Enos Smith, J.P., as Vice-Chairman and senior member of the Council, was called upon to start the pumps; and this having been done, the company moved on to the reservoir. The Chairman and the Engineer having mounted the entrance steps, the former asked Mr. Hirst Simpson to turn the valve. This gentleman did so, and congratulated the Chairman, the Council, and the town on having secured a good supply of water. The works have been carried out by Messrs. Rowell and Sons; Mr. John Eunson, of Northampton, being the Consulting Engineer for the scheme.

Proposed Extension of the Dover Water-Works.—A Local Government Board inquiry was held on Friday last, by Mr. M. K. North, M.Inst.C.E., in regard to an application by the Dover Corporation to borrow £2500 for water-works. It was stated that the proposal was to sink a shaft 180 feet deep in the property of the Corporation, connect it with the existing shaft, and drive a heading of about 600 feet from the shaft under the roadway and under land the property of the War Department, whose consent had been obtained. The object was to obtain a greater supply of water, and increase the storage capacity in the headings. They considered it necessary on account of the natural depletion of the supply; and an increased demand for water was anticipated for hotel lifts and the filling up of empty property. They had also received an application from the Admiralty for water to be used at the harbour. The Corporation thought the reservoir should be larger. Dr. M. K. Robinson (the Medical Officer of Health) expressed the opinion that there would be additional water. There had been an objection to going north-east because of the cemeteries; but he did not believe there would be any percolation. The Inspector said the question the Board would have to carefully consider would be whether the expenditure would be justified by obtaining extra water.

Theft of Gas-Fittings at Colchester.—At the Colchester Police Court last Thursday, Samuel Braddy, a painter, was charged on remand with stealing certain gas-fittings, value 11s. 4d., the property of the Colchester Gas Company. He pleaded guilty. Mr. A. G. Hawkins, who prosecuted on behalf of the Colchester Association for the Protection of Property, stated that the Gas Company had been missing articles for some time, and various people were on the look-out. On the 3rd inst., a police sergeant saw the prisoner carry a bag and a paper parcel to the house of a plumber named Partner, and on following him found he had some gas-fittings in his possession. Prisoner told the sergeant that the Manager had instructed him to take the fittings to Partner for a job he was to do for the Company; but afterwards he admitted the theft. Mr. Hawkins added that Braddy had been employed by the Company eleven or twelve years, and had been a good workman. There was, however, so much of this class of theft going on in the town, that he must ask the Bench to make an example of the prisoner. Mr. H. S. Pike, the Company's Manager, said the prisoner had been suspected for about a year, and had been watched. He had been indirectly cautioned once or twice. Prisoner said he had never taken anything else. He went to Partner's house to see if the fittings were worth anything. The Bench sentenced him to two months' hard labour.

Derby Gas Company's Dividend.—At the meeting of the Directors of the Derby Gaslight and Coke Company last Wednesday, an interim dividend at the rate of 5 per cent. per annum, less income-tax, was declared on the ordinary consolidated stock for the half year to June 30.

Bulawayo Water-Works Company, Limited. — The ordinary general meeting of the Company was held a few days ago. Colonel Lockwood, M.P., presided, and in moving the adoption of the report said the results lately realized were better than those of the last few years, since the Company were enabled to carry £1029 to the credit of profit and loss account. This improvement was accounted for partly by a decrease in working cost resulting from the installation of new machinery and other economies which had been effected, and partly from an increase in the number of consumers for both water and electric light. During the year the Company's prospects had considerably improved, as a large amount of building was being undertaken in Bulawayo. The motion was carried.

The Costs of Promoting the Salford Corporation Bill.—At a meeting of the Salford Guardians last Friday, it was stated that the total cost to them in connection with the Bill of the Salford Corporation was £515. It was submitted by Mr. Reeves that as the Corporation had withdrawn the Bill they should pay the costs. The Chairman said it was not a fact that because the Corporation withdrew the Bill they were compelled to pay the costs of the parties opposing the measure. At any rate, it did not much matter in their case, as the money would come out of the same pocket. Mr. Reeves said that was not the point. The expenditure of these sums increased the poor-rate. A resolution was passed instructing the Clerk to make application to the Corporation for the repayment of the Guardians' costs.

Water Supply for Telscombe.—On Saturday, the 24th ult., the Mayor of Brighton (Alderman Slingsby Roberts) inaugurated, in the presence of a large and representative company, the new water reservoir which has been constructed, as the result of the initiative of Mr. Ambrose Gorham, for the supply of the village of Telscombe with water obtained from the Brighton Corporation, whose Water Engineer (Mr. J. Johnston) had carried out the work. The Corporation extended their mains from Rottingdean to the eastern boundary of the parish, this being the extreme limit of their area of supply; and from this point the Newhaven Rural District Council, through the action of Mr. Gorham, laid the main up to the reservoir, built the reservoir, and laid the mains into Telscombe village. It will hold 20,000 gallons, and the water flows into it by gravitation from the reservoir on the Brighton Racecourse. The work has cost £1400.

Pontefract Gas Undertaking.—It was reported to the Pontefract Corporation a few weeks since that there was a deficiency of nearly £800 on the year's working on the gas undertaking, acquired two years ago from the Gas Company. The Mayor (Colonel Shaw), who is now absent on military duties, wrote to the Council meeting last Wednesday that he had made a special inquiry. The gross profit last year was the greatest ever known, and the working cost considerably lower. They had paid £2866 on borrowed money, £1157 on the sinking fund, and £600 as part of the parliamentary expenses. No similar trading concern could carry such a burden. The profits now exceeded by £2000 the amount required by the Company for statutory dividends; and there had been a reduction of 3d. per 1000 cubic feet in the price of gas. Mr. Lowden, the Chairman of the Gas Committee, agreed with this. The Engineer and Manager (Mr. L. V. Whitaker) added that last year what they had to buy went up, and what they had to sell went down; but everything pointed to a substantial profit this year.

Colne Valley Water Company.—At the half-yearly general meeting of this Company at Bushey last Tuesday, the Directors reported that the capital expenditure during the six months ended the 30th of June amounted to £7215, nearly £6000 of which was incurred in laying a 14-inch trunk main from the pumping-station to Watford Road, Northwood. It is proposed to continue this main to meet the rapidly increasing demand for water in parts of Pinner and Harrow. The profit amounted to £13,234. The balance of the dividend and interest account, after paying interest on the debenture and preference stock, was £18,215, out of which the Directors transferred £500 to the contingency fund account, and recommended the payment of the full statutory dividends at the rate of 10 and 7 per cent. per annum on the several classes of stock, and in addition a payment of 1 per cent. on account of back-dividends on the "A," "B," and "C" stocks; leaving £5000 to be carried forward. For the corresponding period of 1908, the amount carried forward, after paying the full statutory dividends, was £4204.

Exmouth Water Supply.—At the meeting of the Exmouth Urban District Council last Wednesday, the Water Committee informed the members of the receipt of a report from Messrs. G. H. Hill and Sons, on the result of the boring at Dolton Lane. The Engineers mentioned that the boring had reached a depth of 338 feet below the surface, the last 34 feet being in the pebble beds. The official test showed a yield of 40,000 gallons of water per hour, or 960,000 gallons per day; so that, as the estimated additional requirements of Exmouth alone in the year 1931 were placed at nearly 300,000 gallons a day, the supply furnished by the boring was adequate. The water had been analyzed by Mr. Tickle and Professor Percy Frankland, F.R.S., who both spoke of the high quality of it. The final cost of boring amounted to £1608. The parliamentary estimate of the scheme prepared last year was £43,000, of which, however, £5000 was provided to cover the extension of piping, &c., in the district during the period which would elapse before the Council might apply for further borrowing power. The amount attributable to the new source of supply was therefore £38,000. The £1606 which the boring had cost took the place of the £8700 in the parliamentary estimate for the boring, well, and adits; and the £38,000 was thus reduced to £30,906. Again, the level of the water in the borehole when three times the supply was being taken was only about 45 feet from the surface. This fact allowed economical use of a much less costly type of pumping machinery, which was estimated now at £3252. A reduction would also be shown in the cost of the trunk mains. The £38,000 was therefore still further reduced to £88,033.

The Spofforth Gas Company, Limited, has been registered, with a capital of £1500, in £1 shares, to supply the town named, which is near Harrogate, with gas.

The Gas Committee of the West Bromwich Corporation have accepted the tender of Messrs. Humphreys and Glasgow for the reconstruction and extension of the water-gas plant.

The Hclytown Gaslight Company, Limited, was registered in Edinburgh last week. The Company are to take over the undertaking of the existing Company. The capital is £3000 in £1 shares.

When turning on the light of an electric standard in Bolingbroke Road, Wandsworth Common, last Friday night, a lamplighter received a severe shock. A doctor was sent for, but on arrival he found the man was dead.

Messrs. Joseph Taylor and Co. have received an order for one of their best and latest makes of solid-plate lead saturators, including the whole of the leadwork, in connection with the new sulphate plant at the works of the Lochgelly Gas Company, Limited.

The Keymer and District Gas Company have just concluded a contract for the public lighting at Clayton, Sussex, at £2 11s. 6d. per lamp. The Local Authority are to provide £30 towards the tender for the lighting season ending the 24th of June next.

The Directors of the South Staffordshire Water Company have resolved, subject to audit, to transfer £1000 to the credit of the depreciation fund, and to recommend to the proprietors the declaration of a dividend for the half year to June 30 on the ordinary stock at the rate of 6½ per cent. per annum, less income-tax, carrying forward a balance of £8056. For the eight half years to June, 1908, the dividend was at the rate of 7 per cent. per annum; and twelve months ago the amount carried forward was £7764.

The officials and workmen of the Ventnor Gas and Water Company had their annual outing last Wednesday. Leaving Ventnor at nine o'clock, the party drove through Wroxall to Newchurch, where a short halt was made, and then went on to Sea View. After an hour spent there, the journey was continued along the sea front to Ryde, where dinner was served at the Albany. The Directors and Mr. Ineson, the Engineer, Manager, and Secretary of the Company, were, at the conclusion of the repast, heartily thanked for providing so pleasant a day's outing. Three hours were spent at Ryde; and then a start was made for the celebrated Eight Bells at Carisbrooke, where tea was served. Ventnor was reached at ten o'clock.

The Cardiff Water Committee last week again had before them the question of the increase of the salary of their Engineer, Mr. C. H. Priestley, consequent upon the construction of a new reservoir in the Brecon Beacons area. The previous recommendation of the Committee that Mr. Priestley's salary be increased by £250 during the construction was referred back to them, in order that the question of raising the salaries of others under Mr. Priestlay, upon whom extra work would be thrown in consequence of the new works, might be taken into consideration. It was pointed out that under the agreement governing Mr. Priestley's appointment, they could not call upon him to do this work; and if they appointed an outsider, the cost would be considerably greater. Finally, the Committee reaffirmed their previous resolution to increase Mr. Priestley's salary by £250 per annum during the construction of the reservoir, and to give Mr. Neil Peters, the Deputy-Engineer, an increase of £75 a year, and Mr. Rewell, the Engineering Assistant, an increase of 10s. per week during the same period.

APPLICATIONS FOR LETTERS PATENT.

17,246.—Boult, A. J., "Regenerative furnaces." A communication from the Blair Engineering Company. July 24.
17,281.—Hayden, H. L., "Gas-burners." July 24.
17,288.—Snellgrove, H. W., "Gas cooking appliance." July 26.
17,299.—Murray, W. G., and Cox, E. J., "Gas-turbine." July 26.
17,304.—Davis, I. H., "Regulating taps with locking arrangement." July 26.
17,314.—Helps, G., "Gas-burners." July 26.
17,316.—Walton, W., "Body combined with a bunsen tube and mixing-chamber for incandescent gas lighting." July 26.
17,325.—Huff, A. & O., "Inverted burners." July 26.
17,341.—Madras, A. S., "Apparatus for gas-rings." July 26.
17,348.—Westgate, J., "Gas-retorts." July 26.
17,380.—Müller, A., and Bomhard, C., "Purifying gases." July 26.
17,406.—Thompson, W. E., "Testing meters." July 27.
17,420.—Hiby, W., "Treatment of gases produced by destructive distillation of coal." July 27.
17,433.—Bark, B. & S. E., "Anti-vibrator." July 27.
17,458.—Glover, R. B. G., "Street or like gas-lamps." July 27.
17,486.—Delage, M., and Woog, P., "Lighting gas-burners electrically." July 27.
17,496.—White, F. H., "Acetylene generators." July 28.
17,527.—Kurz, J. & R., "Inverted lamps for acetylene." July 28.
17,541.—Zarine, W., "Production of carburetted air." July 28.
17,570.—Crombie, W. A. E., "Distillation of coal, peat, wood, and the like." July 28.
17,574.—Pace, P. C., "Manufacture of air gas." July 28.
17,578.—Scott, J., "Gas-heaters." July 29.
17,591.—Lane, H., "Hydrogen gas producing apparatus." July 29.
17,620.—Siemens Schuckertwerke G. m. b. H., "Indicating differences of pressure." July 29.
17,638.—Kent, W. G., and Hodgson, J. L., "Differential pressure-gauges." July 29.
17,703.—Reavell and Co., Limited, Reavell, W., and Jones, E. W., "Fluid-pressure engines, pumps, or exhausters, compressors, and liquid meters." July 30.
17,705.—Keith, J. & G., "Windlasses for raising and lowering suspended lamps for street lighting." July 30.
17,716.—Parkinson, B. R., and Woodall, H., "Packing of spigot and socket joints of pipes and tubes." July 30.
17,719.—Siemens Schuckertwerke G. m. b. H., "Indicating differences of pressure." July 30.
17,722.—Kent, W. G., and Hodgson, J. L., "Fluid meters." July 30.
17,735.—Aktiebolaget Eskilstuna Separator and Andersson, C. E., "Pressure burners." July 30.
17,736.—Harris, H. W., "Gas valves or cocks." July 30.
17,771.—Laigle, R., "Filaments for gas-lamps." July 30.
17,816.—Bland, C. W., and Glover, T., "Inverted street-lamps." July 31.

It has been announced that letters of allotment of the issue of first mortgage bonds of the Cincinnati Gas Transportation Company, recently advertised in our columns, have been posted.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations, &c., Vacant.

Gas Engineer and Manager. Workington Corporation. Applications by Aug. 20.
Gas Manager and Secretary. Cockermouth Urban District Council. Applications by Aug. 17.
Clerk of Works (Knowledge of French) for Continent. No. 5123.
Draughtsman. No. 5124.
Stoker and Lamplighter. Builth Wells Gas-Works.

Situation Wanted.

Gas Company's Office Work or Show Room, &c. No. 5118.
Engineer with Experience in Retort Erection. No. 5119.
Representative. No. 5122.

Plant, &c. (Second-Hand), for Sale.

Purifier, Exhauster and Steam Engine, Gas-holders, &c. Kirkintilloch Gas Department.
Station Meter and Governor. Widnes Gas-Works.

Patents Licences.

Acetylene Generators, Lamps, &c. Haseltine, Lake, and Co., Chancery Lane, W.C.

Meetings.

Brighton and Hove Gas Company. London Office, Aug. 27, Two o'clock.
Bromley and Crays Gas Company. Offices, Aug. 12, Six o'clock.
North Middlesex Gas Company. London Office, Aug. 25, 2.30 o'clock.
Southgate Gas Company. London Office, Aug. 19, 3.45 o'clock.

TENDERS FOR

Coal and Cannel.

Clacton Urban District Council. Tenders by Aug. 18.
Rochdale Gas and Electricity Department. Tenders by Sept. 1.
Tenby Gas Company. Tenders by Aug. 20.

Lime and Canvas Bags.

Bradford Gas Department. Tenders by Aug. 27.

Meter (Station), &c.

Cleator Moor Urban District Council. Tenders by Aug. 20.

Nitrate of Soda.

Bradford Gas Department. Tenders by Aug. 27.

Pipes, &c.

Tredegar Urban District Council.

Spirits of Salt.

Bradford Gas Department. Tenders by Aug. 27.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

ENGINEER, with Experience in Retort Erection, both Horizontal and Vertical, in England and Abroad, seeks an ENGAGEMENT where his Constructional Skill would be of Advantage.
Address No. 5119, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GENTLEMAN, having very extensive Connection among Gas and Railway Companies, Corporations, &c., desires to REPRESENT a First-Class Firm.
Address No. 5122, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Stoker and Lamplighter for Small Works. Constant Situation to suitable Man. Wages 25s. weekly.
Apply to S. G. Tulk, Gas-Works, Builth Wells.

CLERK of Works required during the Carrying out of Extensions at a Gas-Works on the Continent, including New Retort-House equipped with Conveying Machinery, &c., &c. Knowledge of French indispensable.
Apply, stating Age, Experience, References, and Salary expected, to No. 5123, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

DRAUGHTSMAN.

WANTED, a Draughtsman for Civil Engineer's Office, thoroughly Capable of making all Drawings for Water and Gas Works Schemes.
Salary, 50s. per Week.
Apply, by letter, sending *copies* only of Three recent Testimonials, and stating Full Qualifications, to No. 5124, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

COCKERMOUTH URBAN DISTRICT.

GAS MANAGER AND SECRETARY.

THE Cockermouth Urban District Council invite APPLICATIONS for the Position of GAS MANAGER and SECRETARY, who will be required to devote the whole of his time to the duties of the Office.
Salary, £120 per Annum, with free House, Coal, and Gas, and the privilege of taking an Articled Pupil.
Applications, endorsed "Gas Manager," stating Age and Particulars of previous Experience, together with not more than Three recent Testimonials, to be sent in to me the undersigned on or before the 17th day of August inst.
The person appointed will be required to take up his duties on the 1st of September next, or as early as possible after that date.

J. W. Drummond,
Clerk of the Council.

Cockermouth,
Aug. 5, 1909.

BOROUGH OF WORKINGTON.

GAS ENGINEER AND MANAGER.

WANTED, by the Workington Corporation Gas Committee a qualified GAS ENGINEER and MANAGER to Take Entire Charge of their Gas Undertaking. Make of Gas, upwards of 100 Million Cubic Feet.
Salary, £250 per Annum.
Candidates must state Age, Training, Qualifications, and Particulars of Experience. Chemistry, Theory and Practice of Gas Manufacture, and some actual Works Practice indispensable.
Applications, endorsed "Gas Engineer and Manager," and accompanied by *copies* of Testimonials of recent date, not exceeding Three (which will *not* be returned), must be lodged with the undersigned on or before noon of the 20th inst.
Candidates must state when they can commence duties.
Canvassing the Members of the Committee, either directly or indirectly, will be a Disqualification.

John Warwick,
Town Clerk.

Town Hall, Workington,
Aug. 5, 1909.

PURIFIERS—Set of Four, 12 feet Square, fixed complete, £300. A bargain. Also Four 6 feet Square, Two 8 feet, Four 8 feet, and Two 12 feet square PURIFIERS. Cheap.
Firth Blakeley's, Thornhill, Dewsbury.

GASHOLDERS—Splendid, 45 feet diameter, and New STEEL TANK fixed complete, £600 to Plan and Specification. Also 50 feet Single-Lift and 50 feet Double-Lift. Cheap, with STEEL TANKS. Can be seen temporarily erected.
Firth Blakeley's, Thornhill, Dewsbury.

WASHERS and Scrubbers — Two "Livesey" WASHERS. One "Clapham" WASHER. TOWER-SCRUBBERS, 3 ft. 6 in. by 16 ft., 4 ft. by 16 ft., and 7 ft. diameter by 55 ft. high. Sold at Bargains, being overstocked.
Firth Blakeley's, Thornhill, Dewsbury.

CONDENSERS—Clapham's, also Cutler's Water-Tube CONDENSERS. Pipe CONDENSERS, 4-inch to 10-inch diameter. Annular CONDENSERS, 8-inch, 10-inch, and 12-inch. Erected Complete and Cheap.
Firth Blakeley's, Thornhill, Dewsbury.

STATION Meters and Governors— Several in Stock, 4-inch to 18-inch, with New Drums. Prompt Execution.
Firth Blakeley's, Thornhill, Dewsbury.

PUMPS, Tanks, &c.—Two and Three-throw PUMPS, Belt or Steam Driven, and Single and Double-acting Verticals and Horizontals. Large Stock of Tanks and all Sundries.
Firth Blakeley's, Thornhill, Dewsbury.

FOR SALE—A 20,000 Cubic Feet per hour STATION METER, with 12-inch Valves and Connections Complete. Good Condition. Also a 14-inch STATION GOVERNOR (W. Cowan's Patent).
Further Particulars from the Gas-Works, Widnes.

BURGH OF KIRKINTILLOCH.

(Gas Department.)

THE above Council have for Disposal the following SECOND-HAND PLANT; and are prepared to receive Offers for same.
One PURIFIER, water-lute type, 20 feet by 10 feet, with Three Valves and Connections.
One Laidlaw EXHAUSTER and STEAM-ENGINE combined on one Bed-Plate, with Valves, Bye-Pass Compensator, and Steam Governor; maximum capacity, 10,000 cubic feet per hour.
One small Single-Lift GASHOLDER; capacity, 12,500 cubic feet.
One Double-Lift GASHOLDER; capacity, 96,000 cubic feet.
Further Information may be had from the undersigned.

James Bell,
Engineer and Manager.

Gas-Works, Kirkintilloch.

URBAN DISTRICT COUNCIL OF TREDEGAR.

TENDERS are invited for the Supply of 66 Yards of 12-inch and 555 Yards of 10-inch Cast-Iron Spigot and Socket GAS-PIPES.
Full Particulars and Form of Tender may be obtained from the undersigned.

D. Walter Davies.

Gas and Water Department,
Manager's Office, Tredegar, Mon.,
July 31, 1909.

TENDER FOR COAL.

THE Directors of the Tenby Gas Consumers Company, Limited, invite TENDERS for the Supply of 2000 Tons of GAS COAL for Delivery over the ensuing Twelve Months at the Tenby Railway Station or Harbour.
For Particulars and Form of Tender Apply to the undersigned.
Sealed Tenders, endorsed "Tender for Coal," to be delivered to the Secretary, C. W. R. Stokes, Esq., Bellevue Chambers, Tenby, on or before Aug. 20.

Alfred H. Brookman,
Engineer and Manager.

Tenby, Aug. 6, 1909.

CLACTON URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for the Supply and Delivery of about 5000 Tons of Best Screened GAS COAL, in Quantities as may be required during the ensuing Twelve Months.
Particulars and Form of Tender may be obtained upon Application to the Consulting Engineer, Mr. Sydney Francis, Assoc.M Inst.M.E., Town Hall, Clacton-on-Sea.
Tenders, Sealed and Endorsed "Tender for Coal," to be delivered to the undersigned not later than noon on Wednesday, the 18th inst.
The Council do not bind themselves to accept the lowest or any Tender.

Geo. T. Lewis,
Clerk to the Council.

Town Hall, Buildings,
Clacton-on-Sea, Aug. 4, 1909.

CLEATOR MOOR URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for a STATION METER of 6000 Cubic Feet Hourly Capacity at 100 Revolutions. To be Complete with Cradle, Clock, Tell-Tale, Syphon-Overflow, 8-inch Valves, and all other necessary Equipments.
With each Offer there must be furnished a full Description, Dimensions, and Design of the Meter.
The Council do not bind themselves to accept the lowest or any Tender.
Prices to be quoted Delivered and Erected on the Council's Foundation at Cleator Moor Gas-Works.
Sealed Tenders, endorsed "Station Meter," to be forwarded to the undersigned not later than Aug. 20, 1909.

Henry Rothery,
Clerk to the Council.

Public Offices, Cleator Moor,
July 30, 1909.

TO ALKALI MANUFACTURERS, CHEMICAL MERCHANTS, LIME MERCHANTS, AND BAG MERCHANTS.

THE Gas Committee of the Bradford Corporation invite TENDERS for the Supply of the undernamed GOODS, required at the Chemical Works, Frizinghall, during the ensuing Twelve Months—viz.:

16,000 Carboys of SPIRITS OF SALT, containing a Minimum of 28 per cent. HCl, and not more than 0·02 per cent. Arsenic, delivered in Lots of 400 as required.
80 Tons of refined quality NITRATE OF SODA, containing a Maximum of 4 per cent. Refraction, including not more than 1 per cent. of Chlorides, delivered in 10 Ton Lots as required.
300 Tons of Best Hand-Picked LIME, free from Stone, and testing 96 per cent. Ca.O. delivered at Frizinghall Siding (Midland Railway) in Truck Loads as required.
20,000 Second-Hand CANVAS BAGS, known as "Bombay Twills," measuring 27 in. by 45 in., mended and perfect, delivered in Lots of 2500 as required.

Tenders, endorsed "Tender for Spirits of Salt," "Nitrate of Soda," "Lime," or "Canvas Bags," as the case may be, together with Sample Canvas Bag, to be forwarded to the Town Clerk, on or before Nine a.m. Aug. 27, 1909.

COUNTY BOROUGH OF ROCHDALE.

TO COLLIERY OWNERS AND OTHERS.

THE Gas and Electricity Committee of the above Corporation invite TENDERS for the Supply of 50,000 Tons of GAS COAL during a period of Ten Months from the 1st of September, 1909.
Forms of Tender and any further Particulars may be obtained on Application to Mr. T. Banbury Ball, the Manager, at the Gas-Works, Dane Street.
Tenders, endorsed "Gas Coal," and addressed to the Chairman of the Gas and Electricity Committee, must be sent in to me not later than Noon on Wednesday, Sept. 1, 1909.

By order,
Wm. Henry Hickson,
Town Clerk.

Town Hall, Rochdale,
Aug. 5, 1909.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Friday, the 27th of August, 1909, at Two o'clock p.m., precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1909; to declare Dividends; to elect Auditors; and for other purposes.
The TRANSFER BOOKS of the Company WILL BE CLOSED from the 14th to the 27th of August, both days inclusive.

By order,
Ernest L. Burton,
Secretary.

5, Great Winchester Street,
Old Broad Street, London, E.C.,
Aug. 9, 1909.

BROMLEY AND CRAYS GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held on Thursday, the 12th day of August, 1909, at Six o'clock p.m. precisely, and on this occasion at the Company's Offices, 156, High Street, Bromley, Kent, to receive the Report of the Directors; the Balance-Sheet certified by the Auditors; to declare a Dividend; and to Transact generally the Business of a General Meeting.
The TRANSFER BOOKS WILL BE CLOSED from the 29th of July to the 12th of August, 1909, both days inclusive.

By order of the Board,
Henry W. Amos,
Secretary.

Offices: 156, High Street,
Bromley, Kent, July 27, 1909.

NORTH MIDDLESEX GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Wednesday, the 25th day of August inst., at Half-past Two o'clock p.m., to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1909; to declare Dividends; and for other purposes.
The TRANSFER BOOKS of the Company WILL BE CLOSED from the 12th to the 25th of August, both days inclusive.

By order,
Ernest L. Burton,
Secretary.

Secretary's Office: 5, Great Winchester Street,
Old Broad Street, London, E.C.,
Aug. 5, 1909.

SOUTHGATE AND DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Thursday, the 19th day of August inst., at 3.45 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1909; to declare Dividends; to elect an Auditor; to determine the remuneration of the Directors; and for other purposes.
The TRANSFER BOOKS of the Company WILL BE CLOSED from the 6th to the 19th of August, both days inclusive.

By order,
Ernest L. Burton,
Secretary.

Secretary's Office: 5, Great Winchester Street,
Old Broad Street, London, E.C.,
Aug. 4, 1909.

THE Proprietor of the Patents No. 7188 of 1901, for "IMPROVEMENTS IN OR RELATING TO ACETYLENE GAS-LAMPS or GENERATORS;" No. 11,612 of 1902, for "ACETYLENE GAS-LAMP for TABLE USE; No. 23,629 of 1903, for "IMPROVEMENTS IN ACETYLENE GAS-GENERATORS;" No. 10,185 of 1905, for "IMPROVEMENTS IN ACETYLENE GAS-GENERATORS" is desirous of entering into Arrangements, by way of LICENCE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring their full Development and Practical Working in this Country.
All Communications should be addressed in the first instance to Haseltine, Lake, and Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, London, W.C.

Printed and Published by WALTER KING, at No. 11, BOLT COURT, FLEET STREET, in the CITY OF LONDON.—Tuesday, Aug. 10, 1909.

JOURNAL OF GAS LIGHTING
ATER SUPPLY & SANITARY IMPROVEMENT

OL. CVII. No. 2414.] LONDON, AUGUST 17, 1909. [61ST YEAR. PRICE 6d.

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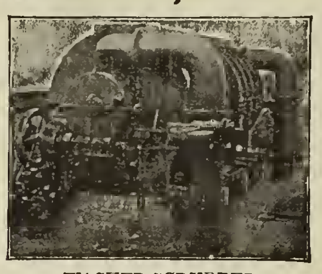

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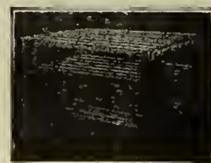

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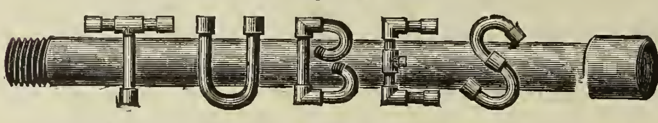

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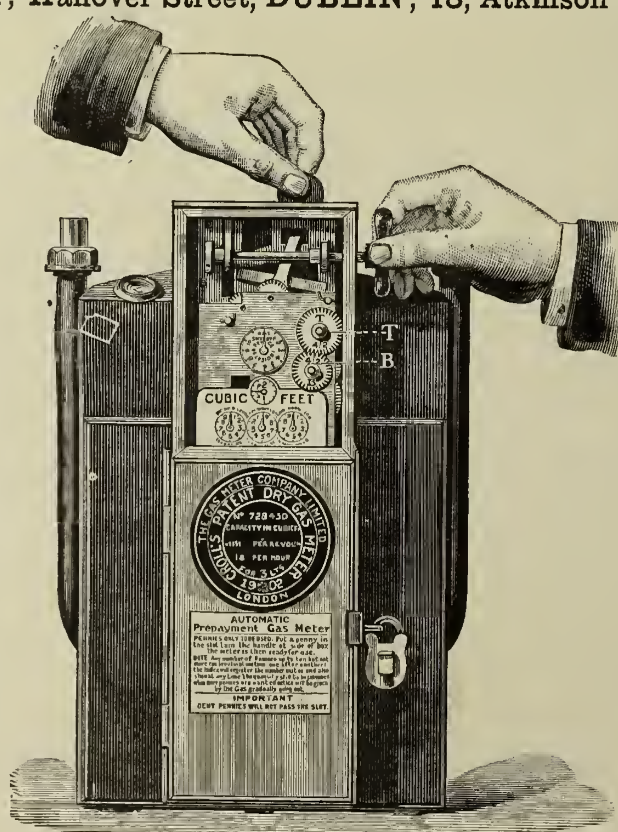

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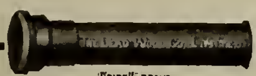

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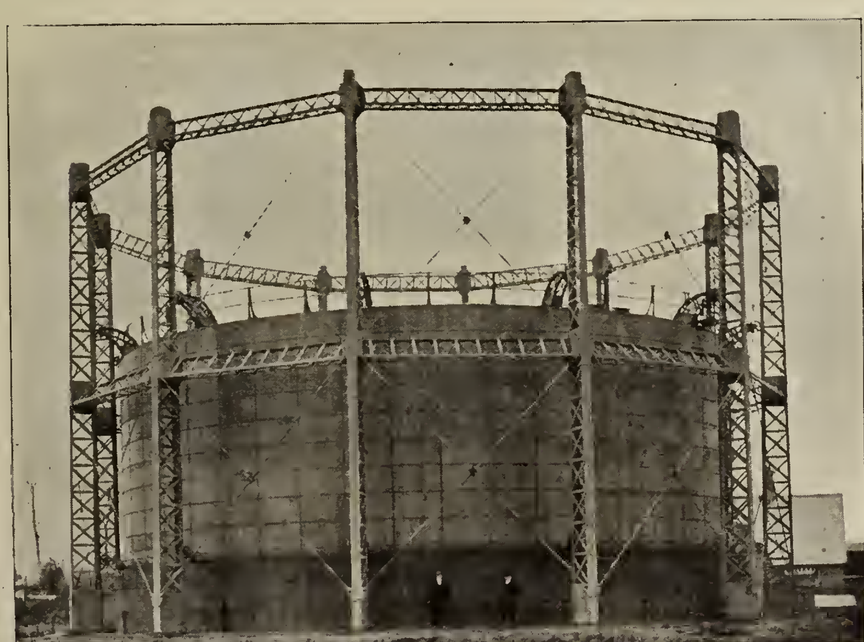

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CONTENTS.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVII., No. 2414.——TUESDAY, AUGUST 17, 1909.

EDITORIAL NOTES—GAS, &c.

The Proposed International Unit of Light.

THE paper by Mr. C. C. Paterson of the National Physical Laboratory, which was reproduced in last week's "JOURNAL" (p. 383) and the communication by Herr E. Brodhun, of the Reichsanstalt, of which an abstract translation was given the week before last (p. 312), contain statements in regard to the proposed international unit of light and to the Harcourt ten-candle pentane lamp which raise doubts as to the expediency of the immediate general acceptance of the understanding at which the National Physical Laboratory has recently announced that it has arrived with the Bureau of Standards of the United States and the Laboratoire Central d'Électricité of France. These statements are extremely disconcerting to those—ourselves among the number—who had been led to believe, by the announcement of the National Physical Laboratory (reproduced in the "JOURNAL" for May 18 last, p. 439), that a satisfactory agreement as to the establishment of an international unit of light had been effected, in regard to the electrical industries at least of three countries, and was in the near future likely to receive general approval. In last week's "JOURNAL," however, it was reported (p. 385) that the Dutch Gas Managers' Association had decided to defer accepting the proposed international unit until it had been brought before, and had been adopted by, the International Photometric Commission which meets at Zurich next year. In view of the doubts raised by Mr. Paterson's and Herr Brodhun's communications, this attitude of the Dutch Gas Association seems eminently reasonable; and it will doubtless be followed by other bodies. The whole question can then be exhaustively debated by the delegates from the various countries represented on the International Photometric Commission; and any recommendation which that body may ultimately make as to the adoption of an international unit of light will no doubt be loyally accepted by the gas interests throughout the world.

Pending such a settlement of the matter, it may be worth while indicating what are the chief points at issue. So far as the gas industry in this country is concerned, the unit of light must represent the average value of the standard spermaceti candle as prescribed in Gas Acts and as used in gas-testing rooms for many years. It has not been disputed that the Harcourt ten-candle lamp as prescribed by the Gas Referees in 1898 for use in official gas testings in the Metropolis faithfully reproduced the average value of ten parliamentary standard candles. But since its introduction, various propositions have been made—by the National Physical Laboratory among others—to define standard conditions for its use. In these conditions it is to be accepted as exactly ten candles. It is evident, however, that in gas testing the value of ten candles which the lamp originally had must be preserved—that is to say, it is ten candles, neither more nor less, in the average conditions of its use in a well-ventilated gas-testing room in this country. These conditions are a temperature of 60° Fahr., a barometric pressure of 30 inches, and an atmosphere containing about 1 per cent. of moisture, about 0·05 per cent. of carbonic acid, and the proportion of oxygen corresponding with that degree of vitiation of normal atmospheric air. There is reason to believe that the light of the argand gas-flame varies approximately in the same ratio as the Harcourt lamp flame with changes in atmospheric conditions; so that hitherto it has not been deemed necessary in gas testing to make corrections for changes in the light of the lamp consequent on variations in the atmosphere. But when for other purposes standard atmospheric conditions have to be prescribed for the lamp, it is clear that they must be those which we have just defined, if the lamp is to have precisely the same value of ten candles which it has had in gas testing since its introduction in 1898. If the lamp were acknowledged to have a value of ten candles exactly in some other atmospheric conditions, it would follow almost indubitably that it would have in gas-testing conditions a value differing (perhaps only by a little) from ten candles—that is to say, the standard by which gas is tested would have been altered, and 14-candle gas as hitherto defined would become (say) 14·1 or 13·9 candles. From the commercial standpoint merely, it is quite conceivable that an acknowledgment that the Harcourt lamp represents exactly ten candles in conditions other than those which prevail normally in gas-testing rooms, may lead to a gas company incurring a forfeiture in respect of the quality of its gas which in present conditions it would escape.

Now according to Mr. Paterson, the value of the proposed international candle is to be one-tenth of the light of the Harcourt lamp burning in conditions which are not the normal conditions of an official gas-testing room in this country. Hence it seems almost certain that the proposed international candle will differ from the standard candle by which alone gas can be legally tested in this country. After proposing at the last session of the International Photometric Commission at Zurich that the standard degree of atmospheric humidity for the lamp should be 1 per cent., Mr. Paterson has since proposed to alter it to 0·8 per cent., whence we might infer that London testing-rooms have a drier atmosphere than those of Berlin, for which in connection with the Hefner lamp 0·88 per cent. has been accepted for many years as standard humidity. It seems likely that the original 1 per cent. more nearly represents the average degree of humidity of a London gas-testing room. We are not, in making this statement, concerned with the error which the National Physical Laboratory states that it made in its early measurements, and for which Mr. Paterson says that corrections have now been applied. We are speaking of the absolute amount of moisture in the air. Incidentally, however, we may remark that Mr. Paterson would be doing a public service if he would explain by what formula readings of the ordinary hygrometer can be converted into the equivalent readings of the ventilating Assmann instrument. He must have found and used such a formula for the correction to which he refers of his original ratios; and many photometrists who have hitherto noted only the readings of the ordinary hygrometer would be glad to be in a position to make the same conversion. Further, the National Physical Laboratory should recognize that the normal conditions of barometric pressure and temperature for gas testing in this country must be specified as the conditions at which the Harcourt lamp has its standard value. Hitherto it has specified no temperature, and a barometric pressure of 760 mm. or 29·9 inches, instead of 30 inches. Also the amount of carbonic acid and (or) oxygen in the atmosphere in standard testing conditions should be defined. Probably the effect of both moisture and carbonic acid on the light of flames is largely indirect and dependent on the corresponding diminution in the proportion of oxygen in the air.

Herr Brodhun's most substantial grievance against the adoption of the Harcourt lamp as the basis of the proposed international candle appears to be that Mr. Paterson has stated that he has found differences of as much as 0·75 per cent. in the light afforded by two different specimens of the lamp. If differences approaching this order of magnitude can in reality be found between two lamps complying with the specification, it must be admitted that the lamp is defective in one of the most essential qualifications which a standard should possess. But we think it likely that Mr. Paterson can now inform us that the difference referred to occurred in an isolated case for which some satisfactory explanation—such as departure from specification in one of the lamps, or an accidental error in the photometry—was ultimately found. Anyhow, it is clear that the proposed international candle will have to be more thoroughly investigated before it can receive general acceptance. The meeting of the International Photometric Commission at Zurich next year should present a suitable opportunity for the settlement of an international unit of light, and of the conditions of its establishment and reproduction.

A communication by Dr. H. Krüss, of Hamburg, who is

one of the members of the International Commission, on the proposed International Unit of Light appears in the "Journal für Gasbeleuchtung" of the 14th inst. which has just come to hand. From the abstract translation of it which is given on another page of to-day's "JOURNAL," it will be seen that there are other good reasons why the proposed international unit should not be adopted without further serious consideration of its merits.

Administration in South London.

IT was a masterly exposition of gas administrative work with which the Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter) interested the proprietors last Wednesday; and those of the latter who think anything about what they then heard must be convinced that the direction of a large Gas Company in these days requires men of many parts—observant, watchful, prudent, and far-seeing. While taking every means to preserve business, to advance it, to produce economies, they have ever to be alert in seeking opportunities for creating fresh markets. There can be no question that to the large gas undertakings of the country, the gas industry as a whole are under indebtedness for the lead they have given in many ways. In that one simple present necessity of keeping in constant touch with the consumers, the companies with extensive areas to serve have adopted a variety of plans; and only last week we were able to describe the latest development of the South Metropolitan Gas Company in the show gas-house, of which they have more than one in their area. The free cleaning and fuel replenishing of gas-fires is another method; and the converting of water-slide chandeliers into fixtures is yet another. That this latter work is being thoroughly done, is testified to by the statement of the Chairman, that the Company have now an accurate record of every unregenerate chandelier that exists in their area of 50 square miles; and the Company are not going to cease their efforts till the last movable appliance of the kind is converted into an article of absolute safety. Such work—such interest—cannot fail to make a good impression.

As commercial and not philanthropic institutions, it is the correct thing for gas undertakings to make matters of this kind known on every convenient opportunity; and to cultivate as far as possible the sense of a community of interest. No Company have worked in this direction with more energy than the South Metropolitan Company; and more particularly since the foundation at their works, some twenty years ago, of the complete co-partnership. The taking into co-partnership of the workers themselves is a source of business stability to the concern. The captious may be disposed to question this, by pointing to the fact that the consumption of gas has been standing at about a level line just recently. Those who know the area are the best judges of the fact that local and general circumstances more than any increase in competition have been the cause of the marking-time of the Company in regard to consumption. The shifting of householders, the depression in trade, the economy of the incandescent gas-burner, and the increase in the price of gas a while ago from 2s. to 2s. 3d. (it is now 2s. 2d.), and the propensity to economy on the part of householders and shopkeepers when business is not brisk, are all factors inimical to advance. That the diagnosis is true is plainly proved by the condition of the electric light undertakings in the district. They are not in so flourishing a state as the companies and the local councils who own those undertakings could fairly wish; and the cheapness of the gas supply, the extensive class of householders in the area who cannot afford to be consumers of electricity, and the activity of the Gas Company, are all influences which it would be to the advantage of electricity if non-existent. The very conditions that in part are their drawbacks are the strength of the Gas Company; and, with revived trade and the immigration of householders, this will be seen. The apparent decrease of 0·26 per cent. in the consumption of gas in the half year compared with the corresponding period of 1908, is not a decrease in fact. Eliminating the consumption of Feb. 29 last year, so as to give correspondence in days, the decrease is converted into an increase of 0·39 per cent., which result is, under the circumstances, very satisfactory. In addition, new connections are constantly being augmented; and, financially, the Company are in a strong position.

In a few striking passages at the commencement of the address, the consumers were shown what an immense benefit the sliding-scale, or co-partnership, principle in gas supply—the principle established by the eminent late Chairman—has been to them. The Company's standard price is 3s. 1d.; gas has been selling lately at 2s. 3d. But the 10d. difference between the 3s. 1d. and the 2s. 3d., Mr. Carpenter points out, has represented no less than £505,389 per annum to the consumers. He might have gone further. It will represent more under the 2s. 2d. price; and it has represented more under the former 2s. price. There was another thing the Chairman did not tell the consumers, and that is that the £1 6s. 8d. per cent. the proprietors get beyond the standard dividend of 4 per cent. only aggregates per annum to between one-sixth and one-fifth of their own gain of £505,389 by being supplied with gas at 10d. below the standard price. When served at the 2s. price, too, the consumers were netting much more than their fair proportion; seeing that the proprietors were not receiving their statutory share. In view of all of which, the Chairman did not exceed his right in claiming that the Company have rendered good service for the consumers, and have been model employers; and that the proprietors deserve to receive their meed of attention likewise. This is an endorsement of the view that was expressed by Sir George Livesey when approaching the end of his Chairmanship of the Company.

The question of coal and the unrest among the miners furnished a subject for Mr. Carpenter; and his comments, in the main, reflect the judgment of the gas industry. Though contracts have been settled at lower prices for the current year, the most gifted in perception evade any prediction as to what the future has in store. We are not out of the wood yet over the Eight Hours Act; and there is a feeling among those behind the scenes that the introduction next January of fresh conditions, in Northumberland and Durham, necessitated by the Act may lead to some temporary disorganization. The fear may not be well-founded; it may be but a phantasm engendered by the recent critical times through which the coal world has been drifting, and the importance of which it is folly to minimize. A stoppage of only two or three weeks' duration would have a vast effect in depleting stocks; and there would be an aftermath of difficulty, precedent assures, in the facts that the normal output is not immediately attained on resumption of work, nor can deliveries of ordinary regularity be depended upon for some weeks after in the scramble for supplies. Let these remarks not be mistaken. The future simply embraces a change in condition that may or may not be amicably arranged; but it is an occasion for protective measures, even by those whose supplies come from fields other than Northumberland and Durham. For the perpetual antagonism that exists in the coal world between capital and labour, the South Metropolitan Gas Company, with their twenty years' experience of co-partnership, naturally cannot find any excuse. But there is the old fear among the miners as to co-partnership doing away with the power to strike. What if it does, if coincidentally it does away with the necessity for striking, and brings about automatically just relationships between owner and worker according to market conditions?

There were several other attractive features in the Chairman's address, all bearing more or less upon the diverse questions that have to engage the attention of gas administrations. Not an unimportant one is the effort to create new markets for residual products, in view of the increased, and still increasing, production. Another is the changed and the changing character of the work in the retort-house. Mr. Carpenter is one of those who has a profound faith in retort-house operations contributing more than they have yet done to the prosperity of the gas industry. Though the Company are now selling upwards of 11,000 cubic feet of gas per ton of coal carbonized, this is not by any means regarded as the high-water mark. With the growth of experience as to the advantage of carbonizing in heavier weights and for longer periods, with accompanying improvement in residuals, the hopes of the "Coalite" people must be correspondingly on the wane—as is the market value of their shares. Though the Chairman did not mention the coalite system by name, his words indicate that it has no sympathizer in him. "We "are gas manufacturers first and foremost, and, broadly "speaking, the greater the proportion of the weight of the "raw coal we can turn into gas the better." More especially must this be the case if the residuals are not depreciated in the process. So far from this being the case, the residuals are all improved in the new system of working—the tar is better, the coke is better, and the ammonia is somewhat more. The views of the administrators of the Company are broad and comprehensive; and the affairs—present and future—of the undertaking stand on a sure foundation.

Complete Freedom or Calorific Power?

The good account and the encouraging signs of trade revival induced the Chairman (Mr. W. G. Bradshaw) to take the brightest view of the circumstances of the hour at the Commercial Gas Company's meeting last Thursday. Mr. Bradshaw is never given to pessimism; and however dull may be the environment in regard to business, he has generally a cheerful way, in his references, of looking beyond and finding there something for gratification. There was one thing on this occasion for which he had not a good word, and could only speak of with regret, and regard as retrograde. That is the acceptance by the Gaslight and Coke Company of a calorific power standard. But we think he looks upon it in too serious a light. The Gaslight and Coke Company, quite as much as Mr. Bradshaw, regret they had to conclude that it was expedient for them to accept the standard, though the illuminating power test still survives. This, however, was only a matter of agreement between two bodies outside Parliament. Parliament itself has not forced a calorific test upon anyone; and Committees of both Houses have only recently refused—on the objections among others of the Governor of the Gaslight and Coke Company—the imposition of such a standard and test on the Coatbridge Gas Company, although there was strong pleading for it on behalf of the Council. And we do not for a moment suppose that, unless there be agreement between parties, Parliament will inflict a calorific power standard and test on any gas undertaking, so long as illuminating power is the recognized parliamentary standard of quality. Mr. Bradshaw has practically the whole of the technical opinion in the gas industry with him when he says that there is no longer real necessity for any kind of test of gas. But the matter has to be considered from a practical and commonsense standpoint; and, from that standpoint, there is the recognition that Parliament will not grant protection and privileges to gas suppliers without—however desirable absolute freedom may be—some form of control over the quality of the supply. No one would be more willing to fight for that freedom than we should be, if we could bring ourselves to believe that the fight would not be a futile one, and so a miserable failure. If it be recognized that Parliament will insist, as a condition of the dislodging of the illuminating power standard, that another, with a different basis, shall be installed in its place, then Mr. Bradshaw has advanced the best of arguments in favour of the calorific power test being the one, when he tells us that no less than 50 per cent. of the gas distributed in the East-end of London is now consumed in the day time. Bearing this in mind, and that incandescent lighting has taken such a vast hold of public favour, it follows that there can only be a fragmentary percentage of gas now used for its naked luminosity.

The Work of the Small Undertaking.

To a considerable extent, the technical matter at the Irish Association meeting was addressed to the managers of small gas-works. The President (Mr. F. J. Eustace, of Tullamore) gave course to the proceedings in this direction. Though competition is rife all around, he has, and very properly, a robust faith in the gas industry; and he is firmly of opinion that the best interests of the portion of the industry that is represented by the small works will be served most effectively by the managers keeping themselves well tutored in current technical subjects. There is, it is to be feared, a disposition on the part of some managers of small gas-works (they constitute the minority) to think that the higher polemics of the hour are not for them. That is an error. Ambition should be to keep oneself abreast of—and not merely even with—the requirements of the existing position. The time is not wasted that is spent in the acquisition of knowledge appertaining to one's profession; and there are not a few pickings to be made by managers of the smallest of undertakings from the topics of present interest and controversy that can receive almost immediate application. The advances in gas manufacture and applications have no absolute delimitation in respect of the dimensions of the works to which they can be applied. A refusal to glean from the fresh knowledge as it is unfolded is akin also to the refusal of personal advancement. To make the best out of one's works is to make the best of one's opportunities and to prove one's worth; and that goes far in commending services to reward, and in proving qualification for higher positions. Small gas-works, with their heavy capitals as measured by outputs, and their all too frequently wasteful manufacturing results, give excellent scope for the application of knowledge to the production of economy, by the improving of working results and financial status. And outside the gas-works, there is much to be done to keep at bay competitors, and to put the undertakings on an increasingly sound foundation.

A special part of the address served as proof that a sulphate of ammonia plant can very profitably be applied to a works even of as low an output as 10 million cubic feet. Frequently, small gas-works are isolated; and the transport of the liquor is thus a heavy expense. Frequently, too, these works are in a favoured position for readily disposing of the sulphate produced. On the other hand, as Mr. H. W. Saville, of Drogheda, showed in his paper, sulphate plants in small works can easily find a short cut to negligent and uneconomical working. The intermittent working of the sulphate plant in works of minor degree is perhaps responsible for carelessness here and there; and for, in consequence of the latter, the production of an indifferent salt, and for a large percentage of the ammonia in the liquor going to waste, with resultant heavy working cost and fuel account, and loss of profit. It is an interesting narrative in Mr. Saville's paper of the defective condition in which he found the sulphate plant on taking charge of the Drogheda works, of the way in which he proceeded to discover the sources of the difficulties, of the remedies applied, and of the favourable results attained. Apart from his methods, the story should serve to stimulate others in small works to see that they are getting the utmost procurable from their liquor. Perhaps the most interesting part of the communication is the description of the simple method he has adopted for preheating, and maintaining at a constant temperature, the liquor being supplied to the still by utilizing the heat of the spent liquor, supplemented by steam. There is nothing new about a preliminary heating of the liquor supplied to the still. There have for some years been methods of doing this incorporated with various plants, with economy in the result, in time and fuel, and through the larger recovery of ammonia. The simplicity of Mr. Saville's attachment to his plant for the purpose of utilizing the waste heat of the spent liquor, and giving the preliminary heating to the liquor passing to the still, is alone a sufficient justification for his paper.

The other paper by Mr. J. E. Enright, of Tralee, covered a vast amount of ground of a diverse nature, which was permitted by the ample heading, "Some Notes and Queries "on the Control of Small Gas Undertakings." The subjects extended from competition to the recognition, or rather want of recognition, of the position of the gas manager in certain undertakings. The paper might conveniently and usefully have been split up into two or three; for such a variety of topic cannot be adequately dealt with in a single discussion. Among the points raised, Mr. Enright considers that, in those towns where differential prices exist for lighting on the one hand and cooking and heating on the other in the case of ordinary consumers, and the single ordinary lighting price prevails for both purposes (with an excess charge) in the case of the prepayment consumers, justice is not done to the latter in respect of the portion of the gas used for cooking purposes. The prepayment consumer has, time and again, had several gas managers take up the cudgels in his defence over the question of his payments; but the old method of payment continues its course without abatement in popularity. There are confessedly matters that would be all the better for remedying; but the difficulty is to remedy them without introducing an undesirable complication.

To allow the slot consumer a differential price for lighting and cooking would not generally commend itself. It would mean either the employment of two meters in one house for a comparatively small consumption, or a discount meter with the cooker, and an allowance for the cooking gas from the total payments into the money-box. With the former, the additional expenditure for the second meter would add an unnecessary cost, which would considerably reduce, on the consumption of the prepayment consumer, the benefit allowable by the adoption of the differential system. Furthermore, the slot consumer, anyway many of this class of consumer, would be unable to appreciate why the gas used for lighting should be more valuable than the gas for cooking. The commercial principles that govern these matters are foreign to, and not understandable by, many of them. A far better plan, in our opinion, is to reduce the price of the whole of the domestic gas to a lower level. Mr. Enright assumes (his figures would not apply to places within our knowledge)

that a prepayment consumer using 12,000 cubic feet of gas, consumes 8000 cubic feet of that amount for purposes other than lighting. Very well. Suppose—ignoring the common prepayment excess—the consumer be charged (as the ordinary consumers are in one case quoted in the paper) 5s. 5d. per 1000 feet for lighting, and 4s. 2d. for cooking, his 4000 feet of lighting gas would cost him £1 1s. 8d., and and his 8000 feet of cooking gas £1 13s. 4d.—or, together, £2 15s. Thus the prepayment consumer (still ignoring the excess price) pays, through his consumption being based on the lighting rate, 10s. more for his 12,000 feet than does the ordinary consumer. Would it not be better to charge him 4s. 7d. all round, which would bring in the same revenue, require less capital expenditure, less labour, less book-keeping, less meter reading, less collection, and less (among the slot consumers) discontent than would the differential system of charging for domestic requirements? There are comparatively few gas undertakings that adopt differential prices for ordinary domestic purposes; and for prepayment consumers especially, they are to be shunned. Mr. Enright had some encouraging experience to relate in connection with the competition of suction-gas plants; and his observations thereon are distinctly worth attention.

West Ham Amalgamation.

The final half-yearly meeting of the West Ham Gas Company has been held after a run of the undertaking for 64 years. At the end of this year, the concern joins its fortunes to those of the Gaslight and Coke Company. The West Ham business will pass over to the larger Company in a strong and vigorous condition, and will give the latter the opportunities they desire and require. Mr. J. Lister Godlee, the Chairman of the West Ham Company, in his new capacity as a Director of the Gaslight Company, has had an opportunity now of examining the position from both the sides of the hedge; and he is confirmed in his original view that the amalgamation is to the mutual advantage of both Companies, and to the consumers in both districts. Among the points of his address to the proprietors, he incidentally stated that the calorific power standard and test agreed between the London County Council and the Gaslight Company had been extended to the West Ham area. The valedictory meeting between the West Ham Company's Directors and proprietors is postponed to the end of December, when the former can give an account of their stewardship during the six months. It must be held then, as with the close of the month there will be no such entity as the West Ham Gas Company.

Traffic and Central Suspension.

In "Electric Supply Memoranda" last week, reference was made to the use of the large tower ladder in Cannon Street for work on the centrally suspended flame arc lamps, and the manner in which vehicular traffic was incommoded thereby. The matter would not have received any attention from us had not an electrical contemporary a short time since worked itself into a state of ebullition over the use of a tower ladder in Fleet Street for the cleaning of the bracket suspended high-pressure lights. Last Thursday at noon, the tower ladder in Cannon Street was again in operation. The electricity suppliers in the City have taken fresh fright at the report of the deputation to the Continent; and some of the flame arc lamps that were not long since suspended there have already been removed, and lamps of a new type have taken their place. It was the displacing of one of the old lamps and the erection of a new one that was again causing inconvenience at noon in Cannon Street on Thursday. There were a couple of men working at the top of the ladder; men protecting it at the foot; and another man hanging out of one of the windows of a neighbouring business establishment manipulating one of the wires attached to the premises. Officers' and men's time in taking down the old lamp and putting up the new, must have more than cut the so-called "profit" out of the £17 10s.—the quoted price per lamp per annum. Past the obstructing tower ladder, the traffic both ways was proceeding at walking pace.

Cautioning Shareholders.

The decision in the case of *Davies v. The Gaslight and Coke Company*, that a loosely worded section in an old Act of Parliament gives a holder of shares—no matter the smallness of his holding, no matter his motives—the right to inspect, free and obtain for a specified fee a copy of the list of shareholders and their addresses, has induced several Boards of Directors to repeat their warnings to shareholders to have nothing whatever to do with any new gas company until they have satisfied themselves beyond doubt that it is a creditable promotion. The Chairman of the South Metropolitan Company (Mr. Charles Carpenter), at the meeting of the proprietors last Wednesday, described the class of ventures he had in mind as "bubble" companies. A little crop of applications by debenture holders in the Law Courts recently, and the appointment of receivers and managers, tell their own tale, and show that "bubble" is not in this instance a misdirected term. Among other companies, the Croydon and the Wandsworth and Putney have attached slips (printed in red) to the half-yearly accounts distributed among the shareholders, cautioning them against the exaggerated prospectuses issued by insignificant gas undertakings.

Distinct Accounts.

In pursuance of the manifest policy of Parliament to have municipal trading concerns run on lines that shall not burden the consumer or user to the advantage of the ratepayer (*quâ* ratepayer), there are indications of an intention to assure that everything shall be kept above-board in connection with such concerns. In the Bury Corporation Bill, it was provided in respect of gas, electricity, and tramways, that all the interest on any principal moneys borrowed by the Corporation and applied by them for the purposes of these undertakings, and all other costs, charges, and expenses of and incidental thereto on revenue account shall be paid and satisfied out of the general fund; and all the rates, charges, damages, penalties, and other moneys received by, or for the benefit of, the Corporation on account of revenue in respect of these undertakings shall be paid and carried to the credit of that fund. It was further provided that the Corporation should keep as part of their accounts a separate account in regard to these several matters. The Local Legislation Committee have disapproved of the principle contained in these clauses, as they hold that every separate remunerative undertaking should be run distinctly and separately. The clauses have therefore been expunged from the Bill.

Presentations to Bolton Gas Officials.

The relinquishment by Mr. W. Smith of the position of Gas Engineer to the Bolton Corporation was recently made the occasion of the presentation to him of a testimonial by the employees. It took the form of a solid silver rose bowl, bearing the following inscription: "Presented to Mr. and Mrs. Smith by the workers at the Lum Street Gas-Works, the Meter Inspectors and Mains Department, on the occasion of their leaving Bolton, July 31, 1909." Mr. Smith, in acknowledging the gift and the good wishes accompanying it, said he had little to regret during his 23 years among the donors; and now that his time for rest had come, he was pleased that his son was to carry on the work in which he himself had laboured for so happy a period. At a gathering of about 200 workmen and their wives held at the Co-operative Hall, a presentation was made to the Superintendent at the Lum Street works (Mr. W. L. Heald), in celebration of his recent marriage. It consisted of a massive silver centre-piece, with side ornaments to match, and was filled with fruit and flowers. Both Mr. and Mrs. Heald expressed their thanks; the lady accompanying hers by the gift of a teapot to all the workmen's wives as a memento of the occasion. Mr. Heald will be leaving Bolton shortly to become Assistant-Manager at the Preston Gas-Works.

The Dellwik-Fleischer Process.—We have received from Messrs. R. & J. Dempster, Limited, of Manchester, an illustrated catalogue of the plant used in carrying out the Dellwik-Fleischer process for the manufacture of water gas. Views are given of installations in various gas-works, accompanied by particulars of working; and these are followed by a goodly list of places at home and abroad where the system is in operation.

Vertical Retorts for the Rochdale Gas-Works.—Last Wednesday, the Gas and Electricity Committee of the Rochdale Corporation received a report from the Works Sub-Committee in reference to the rebuilding and equipment of the old retort-house at the gas-works. The Chairman (Mr. Walker) and the Engineer and Manager (Mr. T. Banbury Ball), in accordance with instructions, have visited the gas-works at Derby, Coventry, Burnley, Wandsworth, Nine Elms, Kensal Green, St. Helens, and one or two works controlled by private companies, to inspect the different kinds of retorts in use. Mr. Walker and Mr. Ball reported to the Works Sub-Committee, who recommended the adoption of vertical in preference to inclined retorts. This recommendation the Committee confirmed, and directed that plans and specifications should be prepared for a new building. As some of the installations of vertical retorts are not in full operation, the deputation are to visit a few places again to see them when completed.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 473.)

Business on the Stock Exchange last week was not at high pressure; but it had brief moments of animation at times owing to special circumstances. Early in the week, apprehension was aroused by threatened complications abroad, arising out of the Chino-Japanese railway dispute and the Græco-Turkish difficulty. But these happily soon assumed a less belligerent form. Then there was some smart work in one or two speculative lines. This, however, had no spreading influence. The opening day was rather shy at the foreign alarms above noted, and Consols had a slight fall; but things were mostly inanimate. Tuesday was very quiet, except for the impending settlement. Consols were down again; but Railways brightened up in view of good returns and fine weather. On Wednesday, the general tendency was inclined to be flat all round, and there was little doing. On Thursday, the tone was quite the reverse; and everything, from Consols downward, made a recovery. Friday was doubtful, and movements were irregular; but Consols had another little advance, together with other of the gilt-edged division. Saturday was, of course, a quiet day; and again the choicest class of securities clearly had the best of it. Consols scored another $\frac{1}{16}$ rise. In the Money Market, there was an abundant supply, unaffected by Stock Exchange requirements; and all demands could be satisfied at easy rates. Terms for discount remained unchanged. Business in the Gas Market was of holiday proportions; and, had it not been for dealings in Gaslight ordinary and the several Argentine undertakings, the list would have been bare indeed. But everything was full of strength, and a large number of issues advanced their quotations. In Gaslight and Coke, the ordinary marked from $105\frac{1}{2}$ to $106\frac{3}{4}$ *cum div.*, and 104 to $104\frac{3}{4}$ *ex div.*—a rise of $1\frac{1}{4}$. The preference made $105\frac{1}{2}$ and $106\frac{1}{4}$ *cum div.*, and the debenture $85\frac{3}{4}$. South Metropolitan was little noticed at from $121\frac{1}{2}$ free to $122\frac{1}{2}$ *cum div.* and 120 *ex div.*—a rise of $\frac{5}{8}$. The debenture made 85. In Commercials, the 4 per cent. changed hands at from $109\frac{3}{4}$ to $110\frac{1}{2}$; and the $3\frac{1}{2}$ per cent. at $104\frac{5}{8}$ and $105\frac{1}{8}$—a rise of 1 each. Among the Suburban and Provincial group, Brentford old was done at from 256 to 257, ditto debenture at $100\frac{1}{2}$ and 101, Brighton original at 214 (a rise of 1), South Suburban at $119\frac{1}{2}$ *ex div.* (a rise of $\frac{3}{4}$), and West Ham at $124\frac{1}{2}$ *ex div.* (a rise of $1\frac{5}{8}$). Many other advances were made without business being done; and they are noted in the list. The Continental companies were quiet. Imperial was unchanged at from 179 to 180, ditto debenture marked 97 *cum div.* and $95\frac{1}{2}$ and $95\frac{1}{2}$ *ex div.*, and Union 96 free and $96\frac{1}{2}$. Among the undertakings of the remoter world, Buenos Ayres was done at $13\frac{3}{4}$ to $13\frac{15}{16}$, Melbourne $4\frac{1}{2}$ per cent. at $102\frac{1}{2}$ (a rise of 1), Monte Video at $12\frac{3}{4}$ to $12\frac{7}{8}$, Oriental at $138\frac{1}{2}$, Primitiva at 7 to $7\frac{1}{8}$, and River Plate at $16\frac{3}{4}$ to 17.

ELECTRICITY SUPPLY MEMORANDA.

Improved Street Illumination—Visual Test v. Biassed "Expert"—"Telephone" System of Charging for Electricity—A "Seabrook" Statement—A Private Consumer's Experience—An Egotistical Council—Supremacy of the Isolated Plant.

The Engineering Correspondent of the "Daily Telegraph" the other day had an article on "Improved Illumination." Generally, we find this particular Engineering Correspondent broad-minded and impartial; and there is nothing in the article before us against which any weighty objection can be brought to bear, excepting that some of the points advanced are impossible. The writer of the article, it seems, has been somewhat unfavourably impressed by the manner in which a local committee in a provincial town recently settled the form of lighting—whether gas or electricity is not stated—to be adopted in a certain street. According to him, visual comparison was the only test applied. His words imply that, in his opinion, this is a sad and crude method of illumination determination. The matter, in his view, should have been settled in a more scientific way; and an expert should have been employed—presumably in conjunction with an illumination photometer. The difficulty, however, is to get an expert in illumination who is really impartial. From a fairly considerable experience, we find that illumination experts have a predilection one way or the other; and that their advice invariably follows the same line as their partiality. Still, we do not know that there is much to be said against the visual test; seeing that the "Engineering Correspondent" of the "Telegraph" assures us, later in his article, that "the eye is a much more sensitive and automatic piece of apparatus than we generally realize." And if our friend had made a study of the results of illuminating tests by several illumination experts in the City of London, and seen in what a glorious mess were the results and conclusions of these experts (who used various illuminating photometers on their nocturnal visits to the City), there is a fair amount of certainty that he would straightway give a preferential vote for the tests made by that "sensitive and automatic piece of apparatus," the eye. Street illumination is for the convenience of the eye; and it would be a queer state of things, therefore, if a majority of the eyes of a Committee could not judge of the lighting which pleases them best—much better than an illumination photometer read by a single expert, with probably a jaundiced eye. An illumination photometer cannot gauge the general effect of the lighting. Moreover, street illumination is not a thing that needs to be weighed out and measured with the exactitude of radium. The most useful effect for situation, as judged by the "sensitive apparatus" for the use of which the illumination is provided, is what is required.

Let us make clear to the writer of the article that we are not by any means the opponents of scientific accuracy—in its proper place; but there is nothing accurate, in point of uniformity, about the conditions of a street, and there is no consistence in the atmospherical conditions in which lights for street purposes are employed. Therefore, no matter how stringent and exacting the conditions in making a test in any particular place, or under any particular atmospheric state, the results would not apply to any other conditions that were dissimilar. We will go so far as to say that, however precise the process of testing that an expert may apply to the lights in a street, there will be nothing sufficiently definite about it all to serve as a common guide or standard; and to get definite conclusions by trial lighting in regard to every street and place would mean a considerable expenditure. We want more commonsense, less finical procedure, and more disinterestedness applied to this street-lighting question. Surely a committee of intelligent men, each with such "sensitive and automatic pieces of apparatus" as a pair of eyes, can judge as to the best light for the purpose under some of the worst of atmospheric conditions; surely, too, a committee of intelligent business men can judge as to the expense of improved illumination, from capital cost of installation to annual expense and renewal, when plain, inclusive figures are put before them, respectively by the gas or electricity undertakings. There is no necessity for them to be confused more than they are at present by the views of experts who are not impartial. Of course, if they can find an expert who is unmistakably impartial and free from duplicity, then by all means—if the local councillors cannot trust their own eyes as to the intrinsic value of the lights offered, if they cannot trust their own commonsense, if they cannot trust their own reading of costs—engage that spotless expert, and grant us the pleasure of an introduction to him.

With characteristic activity and ability, Mr. A. H. Seabrook is already impressing the Marylebone Borough Council with his skill in the commercial management of an electric lighting undertaking. His transfer from West Ham is quite of recent date; and he has since then been engaged in setting, according to his judgment, the Marylebone electricity undertaking in order, and by so doing, showing that he is not altogether in agreement with the conditions under which the business was worked by his predecessor. The Marylebone Electricity Committee have so much confidence in him that they are letting him have plenty of rein. Among his fresh introductions is a new tariff of charges—new for Marylebone; but it has come out with such a flourish of trumpets that the good councillors of Marylebone are no doubt persuaded that there is in it something genuinely novel. The same principle in the matter of tariffs has been applied elsewhere, though perhaps on a less extensive scale; and the only point that might seem novel and clever about it (if it were not known that someone else has previously used the expression) is that to the portion of the tariff applying to what are called "small" consumers for lighting only, Mr. Seabrook has utilized the term the "telephone system of charging." The term carries its own explanation; and it is thought that it will assist to ready comprehension, and bring in a good deal of custom. We are afraid, however, that it will not appeal to those people—they are the great majority—who have not been induced by the latest system of telephone charging to adopt a telephone.

The new tariff is merely the prepayment of a fixed sum per annum, based on the consumers' maximum demand, with 1d. per unit afterwards, no matter the purpose for which the electricity is used. The tariff starts with "large" consumers—the scale running from 200 kilowatts down to 50 kilowatts. The consumer whose maximum demand is 200 kilowatts will pay a fixed charge per annum of £900; the consumer whose maximum requirement is 50 kilowatts will pay a fixed charge per annum of £350—in all cases, be it repeated, with a charge of 1d. per unit afterwards. The conditions for this class of consumer are a ten years' contract, and exclusive use of electricity for lighting and power; the kilowatt charge being payable in advance. We are not altogether sure that the Council can enforce that condition as to "exclusive use." Coming to the medium sized consumers, the scale ranges between 45 kilowatts and 20 kilowatts; the fixed annual charge for the 45 kilowatt user being £337 10s., and for the 20 kilowatt man £180. Excepting that the contract is reduced to five years, the conditions are the same as for the "large" consumers. Then come the "small" consumers for lighting; and the jocular Mr. Seabrook includes in this category the 18 kilowatt consumer (who will have to pay a fixed annual charge of no less than £166 10s. per annum), and at the bottom of the long scale is the consumer with a maximum demand of only $\frac{1}{10}$ kilowatt, who will be called upon to pay a fixed charge of £1 8s. a year. A large proportion of the small consumers will probably have a maximum demand of 1 kilowatt and under. A consumer with a maximum demand of $1\frac{3}{4}$ kilowatts will pay a fixed annual charge of £24 10s.; of 1 kilowatt, £14; of $\frac{3}{4}$ kilowatt, £10 10s.; of $\frac{1}{2}$ kilowatt, £7; of $\frac{1}{4}$ kilowatt, £3 10s.; of $\frac{1}{10}$ kilowatt, £1 8s. The advantages of this system of charging (which will necessitate a fair amount of supervision and inspection) will, it is

thought, be that for all purposes the excess charge will be 1d. per unit, and that only one set of wiring and one meter, notwithstanding diversity of use, will be necessary. The great disadvantage will be the lump sum down, before the "goods" are supplied; and the antipathy of the Britisher to pay for what he does not have or actually consume.

For "heating, cooking, and other uses of electricity," excluding lighting and motors, the fixed charges will range from 5s. a year for ½ kilowatt maximum demand up to £2 2s. for 5 kilowatts, with 1d. per unit additional. But these terms for cooking and heating are only to be enjoyed where "the light of the premises is *exclusively* by electricity from the Council's mains." Mr. Seabrook is satisfied that with this system of charging, in the matter of cooking and heating, he can compete with gas. It would be interesting to know what has satisfied him on this point. It is to be hoped the paper on which his calculations have been made has not been lost in a "Spring clean." If it has not, perhaps he will be good enough to show us what has convinced him. It is one thing to make a statement; it is quite another thing to prove it. Take a four-lamp radiator for which, under the tariff, the fixed charge would be £1 per annum. Supposing a cold season, when that four-lamp radiator might be required in a room 14 hours a day. This would mean 1s. 2d. for a day's electrical heating (and the room then would have to be a boxlike structure, of restricted dimensions, with a low maximum demand for heat), *plus* the proportion of the annual £1. At this rate, it would only require about seventeen days' use of this radiator to run away with £1 worth of electricity, excluding the proportion of the maximum demand charge. About 7500 cubic feet of gas are purchasable in Marylebone for £1; and taking seventeen cold days such as we have imagined, Mr. Seabrook has to show that a gas-fire radiating heat equivalent to the four-lamp electric radiator would consume 441 cubic feet in a day of fourteen hours, to justify the assertion that, on his tariff, electric heating can compete with gas. We wonder if the members of the Marylebone Borough Council do sincerely believe this statement of their new Electrical Engineer, or whether, in approving the report, they simply winked at the audacity of the statement of the new man at the helm. With a deficiency on the undertaking of close on £4000 in the past year, the Marylebone Borough Council naturally want the business hustled up.

Talking of radiators, we have just been examining the gas and electricity accounts of a private consumer who is threatened with a change of electrical meter for lighting. He has only half-a-dozen 32-candle power metallic filament lamps; and his account for the current for these, including meter-rent, worked out last Lady-day quarter to 18s. 6d. His gas account, which includes the lighting of all the rest of the house and a cooking-stove, receded by 6s., as compared with the corresponding quarter of 1908, which recession would about represent the incandescent gas-lamps displaced. The electrical people now tell this consumer that his lighting meter is slow; and that it will have to be changed. The same consumer has had on trial a four-lamp radiator. At the end of the Lady-day quarter, the account for current for this radiator, which was in intermittent use in a bedroom, was £2 16s. 6d., exclusive of the meter and radiator rent. There has been no suggestion that this meter was fast. The radiator has been voted a failure by the user, both on account of the economy of heat and the heaviness of the price paid for it; and the lighting meter is to be changed by the electricity suppliers. The result, however, is that the total payments for gas and electricity in the Lady-day quarter worked out to £3 12s. more than (for gas only) in the corresponding quarter of 1908, the only addition being—regarding the incandescent gas-lights displaced as being equal to the half-dozen 32-candle Osrams installed—the radiator. The consumer is not pleased with his experiment.

The Finchley Borough Council are, as will have been seen by a news paragraph in the "Journal" last week, on their hind legs over what they unquestionably consider to be a gross piece of impertinence on the part of the Local Government Board. The Council have been seeking the sanction of the Board to a loan of £2200 for electric arc lighting in the streets; and the Board have ventured to ask the Borough Council whether they have carefully considered the relative cost of electric and gas lighting, and have requested copies of the reports of the Highways and Lighting Committee on the subject. This seems a modest enough inquiry and demand; but, in reply, the Council have as good as told the Board to mind their own business—overlooking the fact that it is the business of the Board to inquire into the whole subject to see whether or not they shall give their sanction to a loan, and that it is not the duty of the Board that they should half do the work entrusted to them by Parliament. It is only through the Board that ratepayers can get any proper protection against a spendthrift Council. The Council consider they are the best [*sic*] judges—comparing themselves with the Board—as to which illuminant should be used in the streets. The Board have had a somewhat extensive experience in this matter all over the country; and Finchley is not the whole country. But the Finchley Council "do not feel that they can submit to any outside pressure to force upon them an illuminant of which they do not approve, and which they consider for the present purpose is not so satisfactory as the one they propose." They also "respectfully" submit that "the point which the Board are called upon to decide is whether a loan should be granted for the necessary sum to enable arc lighting to be installed, and not as to whether gas or electricity should be used." The Council fail to see that the inquiry of the Board is pertinent to the consideration and decision of the question as to whether the loan shall be granted. The letter, however, indicates bias and egotism, and that, in the interests of the ratepayers, the Council are not wisely administering the public lighting service. It is interesting to know that the Finchley authority believe themselves to be better judges of the duties of the Board than the Board themselves.

It was intended that the Manchester Electrical Exhibition should work wonders for electricity suppliers among the cotton mills; but intention and achievement are on altogether two different planes—that of achievement being much lower than that of intention. Just lately the electricity suppliers have been not a little staggered to find the degree of knowledge of the mill owners on the subject of the low cost at which they can generate electrical energy. It came as a blow to some of them to hear from their very midst, at the meeting of the Incorporated Municipal Electrical Association, Alderman Higham, who is an Accrington cotton spinner, stating that at his mill, with his isolated plant, he can produce electricity at 0·34d. per unit. Corroborative figures have been coming forward; and now "Meteor" of the "Electrical Times" appears to be thoroughly convinced there is no idle boast about this, for he says "there is evidently not much cream to be skimmed from the cotton-mills by the power companies." There is a greater chance for gas-engine driven generating plants; and this after all that has been written and said on the subject of the concentration on the large scale of generating plant! Times change, and opinions with the times.

INSTITUTION OF CIVIL ENGINEERS.

Questions of Reform.

Some time ago in the "Journal," we referred to a Committee formed among the members of the Institution of Civil Engineers, who, unofficially, were directing attention to certain matters in which they thought there was room for improvement in the work of the Institution, and upon which they sought the opinion of members. The Hon. Secretary of the Committee, Mr. A. S. E. Ackermann, has now circulated the results of the voting upon these questions of reform, and correspondence that has passed between the Committee and the Council of the Institution.

In all, 2342 voting papers have been received, and the analysis of 2193 of them is given in schedule form. Upon the question of a re-organization in the constitution of the governing body of the Institution (such as the establishment of Sub-Committees and all classes of members being represented on the Council) there voted 1640, of which there was an affirmative percentage of 72; or if those who were neutral are added, this percentage becomes 91. As to there being regulations for professional conduct and a scale of minimum remuneration, 2085 votes were given, of which 81 per cent. were in the affirmative. For the Institution entering more prominently into research work, 2013 votes were cast, 65 per cent. being affirmative; and about the same number (2085) voted on the question of a system of assisting members and students to obtain appointments. Of these 2085 votes, 86 per cent. were in favour of it. Out of 2063 voters 72 per cent. thought greater prominence should be given to practical experience in the present system of examinations. The total votes on all the eight points submitted reached 13,417, of which 76 per cent. were in the affirmative, or adding the neutrals, this became 91 per cent.

These voting results were communicated to the President and Council in a covering letter of April 5 last; but, after some delay, the only reply from Dr. Tudsbery, the Secretary of the Institution, is under date of June 22, wherein he writes "the Council now instruct me to say that they do not find they have any observations to make on the letter of the 5th of April." Such a result is by no means surprising; but it must be a satisfaction to the members' Committee to find that so many have troubled to return their voting papers and to ascertain that such a large percentage of the voters is in favour of some degree of modification and reform. The Committee's circular letter of July concludes thus: "It is not, however, the intention of the Committee to withdraw from the work which they have taken in hand; and from time to time questions which appear to materially affect the welfare of the Institution will be submitted to the Council for their due consideration."

Determining the Temperature of a Coal Heap.—According to the "Scientific American," the old method of determining the temperature of a heap of coal, by driving pipes and hanging thermometers in them, has been greatly improved by means of a special coal auger, similar in form to that used in mines, but provided with a means of inserting a small maximum thermometer near the point. Extensions 4 feet in length, for convenience in carrying, may be attached to the auger, so that the thermometer can be readily inserted into any depth in a pile. The point of the auger can be driven 20 feet in three to five minutes. About ten minutes are required for the thermometer to attain the temperature of the surrounding coal. Temperatures taken in this manner are much more accurate than those obtained by hanging a thermometer down a pipe, where there is more or less circulation of air, making it impossible to locate the hottest spot. Temperatures obtained by means of the auger have been found to be 40° Fahr. higher than by the pipe method.

PERSONAL.

THE NEW ENGINEER AT NEWCASTLE.

We are pleased to learn that the Directors of the Newcastle and Gateshead Gas Company, at a meeting held last Tuesday, appointed Mr. Thomas Hardie, the Manager of the Redheugh works, Chief Engineer of the Company, in succession to Mr. W. Doig Gibb, who, as is now generally known, is coming to London to take up the duties of Chief Engineer of the South Metropolitan Gas Company. Mr. Hardie's training has specially fitted him for the position he is to occupy. In June, 1890, he was admitted an Associate of Physical Science of the University of Durham; the subjects taken at the examination being chemistry and physics. From the next month till February, 1894, he served a term of apprenticeship with Messrs. John Abbot and Co., Limited, of Gateshead; passing through their several shops and drawing office. In February, 1894, he was appointed Assistant to his brother, Mr. William Hardie, the Engineer of the Tynemouth Gas Company, and the present Mayor of the borough; but he relinquished the position in April, 1896, to take up the duties of Assistant-Manager at the Redheugh works, of which he became Manager in July, 1899. Since he has been at Redheugh, he has superintended the erection of plant capable of producing 7 million cubic feet of coal gas per day, and carburetted water-gas plant equal to the daily production of $1\frac{3}{4}$ millions. He has designed a large portion of the plant necessary for these extensions, besides making all the alterations required for several installations of stoking and coke-handling machinery, designing buildings, and arranging the plant needed for the production of 10 tons of sulphate of ammonia per day. Mr. Hardie will be succeeded at Redheugh by Mr. Norman Reid, who was a pupil of Mr. Gibb, and who (on the completion of his articles) remained with him as Assistant. About three years ago, he was appointed Chemist at the Redheugh works, and still holds this position.

The elected new Chief Engineer of the South Metropolitan Gas Company (Mr. W. Doig Gibb) was present at the meeting of the proprietors last Wednesday, as an interested spectator. The references to him by the Chairman (Mr. Charles Carpenter) were well received by the proprietors, who will welcome the new chief on the next occasion in the seat that was formerly occupied by the Chairman. Mr. Gibb, we believe, will take up his duties at the commencement of October.

SO-CALLED INTERNATIONAL UNIT OF LIGHT.

By Dr. H. Krüss, of Hamburg.

[Abstract Translation of a Communication to the "Journal für Gasbeleuchtung" of Aug. 14.]

The Bureau of Standards at Washington has published a statement, dated May 20, 1909, announcing an agreement at which it has arrived with the English National Physical Laboratory and the French Laboratoire Central d'Electricité in regard to an international unit of light. It is noteworthy that the German authorities have not co-operated therein. The communication states that the unit of light accepted in Germany is the light of the Hefner lamp, as certified by the Reichsanstalt, at an atmospheric pressure of 760 mm. and with an atmospheric humidity of 8·8 litres of aqueous vapour per cubic metre of air. The unit of the National Physical Laboratory is the light of the 10-candle pentane lamp at an atmospheric pressure of 760 mm. and with 8 litres of aqueous vapour per cubic metre of air.

It should here be pointed out that a humidity of 10 litres was formerly adopted by the National Physical Laboratory, and that it was with this found and settled at the International Photometric Congress at Zürich in 1907 that the 10-candle lamp was equal in light to 10·95 Hefners. Now it is proposed to change in England to 8 litres of moisture, on the ground that, owing to a false method of measurement having been used formerly, values too great by 2 litres have been constantly obtained. At 8 litres, the pentane lamp has a rather different value, as its light is then equal to 11·11 Hefners. The Bureau of Standards goes on to point out that the unit of light of the Laboratoire Central at Paris is the bougie decimale, which is one-twentieth part of the platinum unit adopted by the International Congress of Electricians at Geneva in 1884. According to Violle's researches, the platinum unit is equal to 2·08 carcels; and as the Zürich congress in 1907 decided that the carcel was equal to 10·75 Hefners, it follows that the bougie decimale is equal to 1·12 Hefners. This result, however, depends on the none too satisfactory determination of the value of the platinum unit in terms of the carcel by Violle, and on the conversion of the dubious carcel into terms of the Hefner. The unit of the Bureau of Standards, however, has been maintained through a series of carefully arranged electric glow lamps, which have been proved by numerous comparisons with the unit of the Reichsanstalt to have a value of 1·14 Hefners. In order to come into agreement with the pentane unit and the bougie decimale, the Bureau of Standards has decided to reduce the value of its glow lamp unit by 1·6 per cent., so that it will be equal to 1·12 Hefners. This unit, to be termed the "International Candle," would be equivalent to 1 pentane candle, or 1 bougie décimale, or 1 American candle, or 1·11 Hefners, or 0·104 carcel.

These conclusions must strike scientifically minded people with amazement. For a physical unit, it is essential that it should have an explicit definition and be absolutely reproducible, which implies that it is controlled absolutely by measure and weight. This is not the case with the proposed unit, which is deduced from three different units, all of which rest on uncertain bases, and two of which have been brought to the value now adopted by artificial changes. The pentane lamp is certainly the best of the three. But it also has been subjected to variations; and pentane, which is its fuel, is not a material of exactly definable chemical composition, but a mixture of different isomers. Hence samples of different origin may not agree the one with the other. Nevertheless, the Bureau of Standards has announced that from July 1, 1909, it will use the new unit exclusively, and expresses the hope that the Reichsanstalt will from time to time ascertain the ratio of the Hefner to the new unit. It is then very sensibly pointed out that a difference should be drawn between a unit and a standard. The unit can be maintained, even though the standards may be replaced from time to time by better ones. The Hefner lamp may remain the most convenient and exact standard; and it may be anticipated that, by continued careful comparisons between the Hefner lamp and the electric glow lamps the Bureau of Standards will use as sources of light for comparisons, the new unit might be maintained exact within 0·1 to 0·2 per cent.

This movement concerns both electrical and gas circles in America, England, and France; and through the International Electro-Technical Commission at London and the Société Technique de l'Industrie du Gaz advances have been made to German technical men to give it their approval. The German Technical Associations concerned therefore joined in a conference with representatives of the Reichsanstalt on April 23 last; and the following conclusions were unanimously agreed to:—

1.—There is at present no unit of light conforming to all requirements.

2.—It is desirable that an international unit of light should be established.

3.—This unit must be defined in one single manner only.

4.—The unit must be susceptible of exact production at any time by following a description.

5.—Of the units referred to in the proposal of the British Committee, the Hefner lamp best fulfils the last-named condition.

6.—The proposal does not conform with the condition that the unit must be definable in a single manner, because the proposed unit depends on five different standards. It is not therefore acceptable in its present form, as it is to be feared that it would only introduce inexactness and error into the domain of units of light.

7.—The question of the international unit of light should therefore be left for further joint consideration by the national laboratories of the different countries.

8.—At present, the following values may be used for conversions—viz., 1 pentane candle = 1·11 Hefners; 1 carcel = 10·75 Hefners, and 1 American candle = 1·11 Hefners.

9.—For the practical unification of measurements of light, it is essential that, in addition to the same unit of light, the metric units should be adopted internationally in all photometry.

In regard to the last point, it may be pointed out that in England measurements of illumination are stated not in "lux" or metre-candles, but in candle-feet, which renders comparisons extremely difficult. In the gas industry, also, the introduction of an international unit of light would not generally lead to the results being comparable, because the methods of measuring and of stating results in terms of the consumption of gas per carcel, or of candles per 5 cubic feet, would still remain insusceptible of exact comparison or conversion.

Mr. Montagu Somes Pilcher, for many years one of the Auditors of the Imperial Continental Gas Association, and who died last March, left estate of the gross value of £77,152, with net personalty £67,594.

At the last meeting of the Neath Town Council, a sum of £100 was voted to Mr. R. A. Browning, the Gas Engineer and Manager, for extra services rendered in connection with extensions at the gas-works during the past few years.

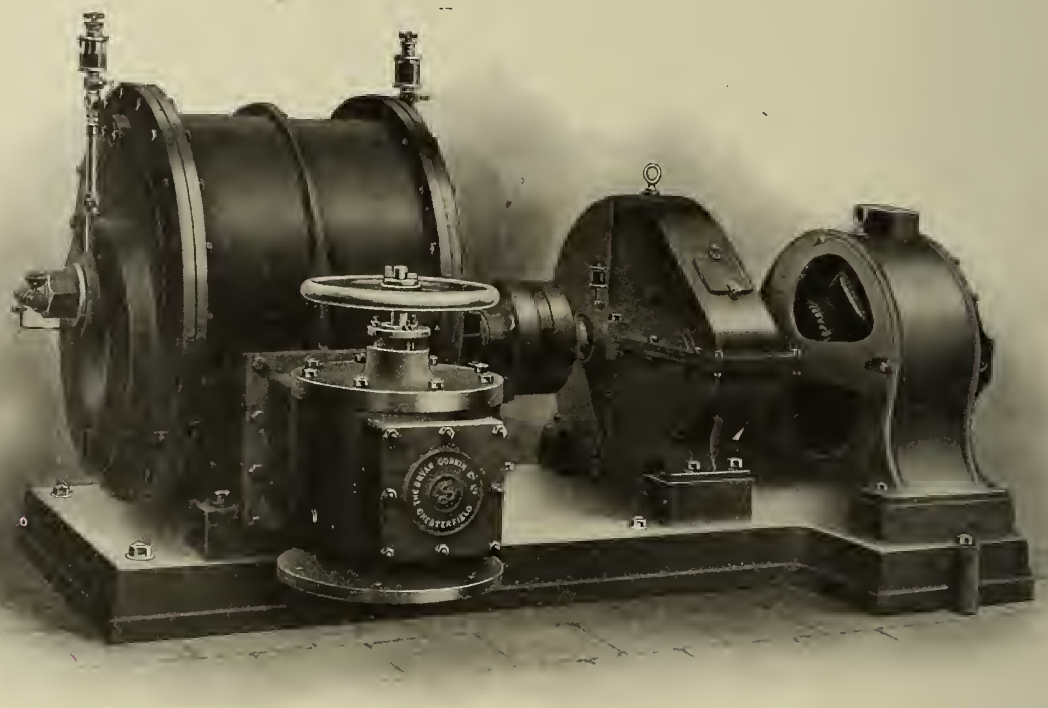
Experiments on a large scale on the underflow or sub-surface flow of water through saturated sand or gravel are being made by the United States Reclamation Service in the Arkansas Valley, Western Kansas. After a search and tests to find a supposedly heavy underflow, a row of wells was sunk across a valley near Deerfield, and pumps were erected there. A "Press Bulletin" issued by the Service states that the wells and pumps lowered the water plane 19 or 20 feet below the river level; also that during the latter part of 1908 the wells began to weaken materially. By April, 1909, the gravels had become filled again on the north side of the river; but in the valley on the south side the "underflow" was not sufficient to restore the amount pumped the preceding year. Experience shows that the so-called "underflow" is not a very reliable source of water supply on a large scale.

ELECTRICALLY-DRIVEN GAS-EXHAUSTERS.

In many quarters attention has of late been given to the driving of gas-exhausters by electric motors; and a recently-issued catalogue of plant manufactured by the Bryan Donkin Company, Limited, of Chesterfield, contains an illustration (which we here reproduce) of an exhauster and motor mounted on one cast-iron underbed—designed for use in gas-works where the power is distributed electrically. Regulation can be effected by means of automatic electrical regulators of the Company's design, in which the speed of the motor is varied so that the vacuum is kept constant. In this way bye-passing can be done away with; and wear and tear of the plant is kept at a minimum.

Writing on the subject, the Company point out that "exhausters driven by electric motors are being put down to a much larger extent than formerly; and it is highly probable that, in future, new large gas-works will have their own electric-power stations and drive all their auxiliary machinery by means of electric motors." In the motor-drive to an exhauster shown, the motor is geared to the exhauster through double helical machine-cut gear running in oil. The Bryan Donkin Company have had considerable experience in arranging electrically-driven plants—some being mounted as shown in the photograph; others have been arranged with worm reduction gear; while others, again, have two sets of double helical gear in a gear-box. In this case, the motor and exhauster shafts are exactly in line with one another.

These motor-driven exhausters are arranged with different methods of control. The majority are put down to run at one speed only; the motor being started by the usual main-switch



Standard Electrically-Driven Gas-Exhauster.

and starting-switch. Any surplus gas is taken care of by the bye-pass. In other cases, the speed of the motor is varied by resistances either in the shunt or the armature circuit; and in some instances by a compound rheostat, controlling both currents. These switches are operated by hand. If it is desired, however, to make the control automatic, the equipment shown in the smaller engraving is suitable. This consists of a Bryan-Donkin

Control Equipment for an Electrically-Driven Gas-Exhauster.

hydraulic regulator similar to those in use with their steam sets, but slightly modified to suit the special conditions. This is coupled by means of the horizontal rod to a two-way oil-break switch, which controls the solenoid operated regulator on the front panel. This front panel also contains a double-pole main-switch and fuses, and a starter with "no-voltage" and "overload" releases.

The method of operating is as follows: The horizontal coupling rod is lifted off the oil-break switch-handle, and the plant run up to speed by the starter. The oil-break switch is then operated by hand until the desired vacuum in the inlet of the exhauster is attained. This will have brought the bell of the hydraulic regulator to its central position. The coupling rod is then connected to the oil-break switch; and as the bell moves up or down with slight variations in the vacuum, the oil-break switch will be moved to make contact either at one side or the other. This will cause either one or the other of the solenoids to be energized, and the regulator switch to be moved accordingly. As the vacuum increases, the speed will be reduced *vice versâ*.

The "Annuaire Durand" of Gas and Electricity.—We have received from Madame Paul Durand, the owner and general manager of our contemporary "Le Gaz," the "Annuaire Général des Industries de l'Eclairage, du Chauffage, et de la Force Motrice par le Gaz et l'Electricité" for the current year. This directory, which is known to those of our readers who are in any way interested in Continental gas undertakings, was first published in the year 1874 by M. Paul Durand, who devoted a great deal of personal attention to it up to the time of his death about six years ago. It was then continued under the supervision of his widow, who has now entrusted the editorship to M. Maurice Lelièvre. As the present is the thirty-fifth year of issue, the general contents of the book need only be briefly indicated. The gas section is divided into five parts, giving lists of the towns lighted by gas, gas lighting and heating companies, makers of gas plant and appliances, and French patents issued. The section devoted to electricity furnishes similar information on this subject. Lists of technical publications, of the plans constituting the volumes of the "Constructeur d'Usines à Gaz," and of books bearing upon the two industries concerned, are given; and the concluding chapter contains the practical instructions in photometry prepared by MM. Dumas et Regnault in 1860. It will thus be seen that the contents of the book are of a varied and useful character; and the Editor has endeavoured to place the "Annuaire" at the very head of similar works for the completeness and accuracy of the information it furnishes. The matter is so arranged as to be easily referred to; and there is a useful index. It is published by Madame Durand, at No. 12, Rue Fontaine, Paris (IX.), at the price of 3 frs. 10c. post free to places abroad.

ELECTRIC SUSPENSION RAILWAY FOR COAL TRANSPORT.

An interesting example of an electrical suspension railway is the one recently constructed by Messrs. Adolf Bleichert and Co., of Leipzig, for the Hamburger Freihafen-Lagerhaus-Gesellschaft.

The fact that the coal stores are located in the cellars on the street side (away from the River Fleth, where the barges arrive), and that the openings for shooting in the coal are also on the side-walk on the Bandtor Quay, precluded the idea of cartage, as such an arrangement would seriously disturb the traffic of what is a very busy street. It was, therefore, necessary to arrange for aërial transportation; and the conditions favoured the adoption of an electric suspension railway—a system which in several other respects may also be considered of high efficiency. The track consists of an I-iron running rail carried on wrought-iron trestle framework stretching for a certain distance over the water, as shown in the second photograph. It then crosses over a bridge, takes a sharp curve round the corner of the accumulator house (see photograph No. 1), and is carried the length of the street on strong masts anchored to the masonry work of the boiler-house. The iron construction has been made to harmonize with the architectural features of the building. A bare trolley wire runs alongside the rail, from which the car receives current through a spring-loop.

The working is very simple, as all the movements are controlled from any fixed point. By means of a few simple manipulations, the workman stationed on the Fleth steps lowers the car over the barge, where a full bucket is waiting to be exchanged for the empty one. On switching-on the current again, the car rises to its highest position and stops automatically. On again switching-on, the car commences its trip, is weighed while travelling (by a "Schenck" weighing appliance), and finally arrives in front of the boiler-house. A workman stationed here lowers the bucket over one of the discharge holes, tips it, and returns it to the shore.

A special advantage of the method selected by the Hamburger Freihafen-Lagerhaus-Gesellschaft is the fact that no re-handling of the coal is necessary during the transport, with the result that it suffers no damage from falling, whereas with the methods of conveying bands and elevators which were previously employed, a very complicated system would have been required, with re-handling several times.

Suspension Rail over Street.

Unloading Coal Barges.

FIRE LOSSES THROUGH GAS AND ELECTRICITY.

Our brisk little American contemporary "Acetylene Journal" has been in the habit of giving from time to time statistics of the fatalities and fire-losses caused through different illuminants in the United States. It has made arrangements for securing reports of, as far as possible, all accidents due to illuminating agents; and it gives brief details of those in which fatalities occurred, and a summary of the losses through fire consequent on accidents of this class. As the object of the compilation is to demonstrate the safety of acetylene relatively to other illuminants, and to petroleum in particular, no bias towards town gas or electricity can be alleged. In regard to town gas, however, it should be remembered that about 90 per cent. of the gas supplied in the United States is carburetted water gas, which is a far more potent asphyxiating agent than the coal gas which, according to the latest Board of Trade returns, forms over 89 per cent. of the gas supplied by authorized gas undertakings in this country. Hence it is not surprising to find the fatalities due to town gas in the American statistics high, and that the greater number of them are ascribed to asphyxiation.

The latest summary published refers to the months of April and May last. There are 168 fatalities reported, of which 90 were caused by gasoline and kerosene, 50 by town gas (43 being cases of "asphyxiation"), 27 by electricity, and one by acetylene. The losses by fire during the same period amounted to: From gasoline and kerosene, £126,360; from town gas, £49,220; and from electricity, £144,000. Acetylene is given a clean record in respect of fire losses, perhaps because the statistics do not include any losses of less than £200 per fire. The point to which attention should especially be given is that the damage to property caused by fires due to electricity was three times as great as that resulting from fires due to town gas, and even exceeded that caused by kerosene and gasoline fires. It cannot be argued that the period in question was a particularly unfavourable one for electricity in this respect, for on turning back to the statistics next before those quoted which have been published by the "Acetylene Journal," we find losses by fire in one month aggregating: From gasoline and kerosene, £97,860; from town gas, £30,400; from electricity, £110,800; from acetylene, £6800. That is to say, electricity did over $3\frac{1}{2}$ times as much damage by fire as did town gas. The import of these figures as to the agent which should be adopted for the lighting of valuable premises is obvious.

Export of Monazite Sand from Bahia.—According to the British Consular report on the trade of Bahia, which has just been issued by the Foreign Office, the export of monazite sand during 1908 amounted to upwards of 2000 metric tons; being considerably in excess of the export during the preceding three years. All the monazite sand exported from Bahia is derived from a certain stretch of sea beach in the southern part of the State. The quantity to be found in the deposit varies considerably from time to time; and the collecting of the sand is largely dependent upon weather conditions. The following figures show the export of sand from Bahia during the past five years: 1904, 2901 tons; 1905, 1039 tons; 1906, 945 tons; 1907, 1741 tons; 1908, 2114 tons.

Spontaneous Heating of Coal.—In a paper read before the Birmingham Section of the Society of Chemical Industry early in the year, and given in the July number of the Society's "Journal," Mr. Richard Threlfall, F.R.S., sets out some of the results obtained by the chief investigators of this subject. Fayol's conclusion is quoted, that "there is a direct relation between the liability to spontaneous heating and the height and volume of the heap in which it occurs. If the heap is small, the temperature rises to a certain point, after which it becomes stationary, and then falls again." The New South Wales Commission verified for themselves a similar piece of evidence in regard to the influence of the depth of the heap. The Engineer of the Australian Gaslight Company, of Sydney (Mr. T. J. Bush), drew the attention of the Commission to a fact he had noticed in connection with the coal-stores belonging to his Company. In one of these stores the coal was never more than 14 ft. 6 in. deep, whereas in the other it was 20 feet deep. The coal in both stores was exactly the same. The heap 14 ft. 6 in. deep never fired; but the other heap was always hot, and generally on fire at one or more points.

NOTES FROM WESTMINSTER.

For the most part the Committee lobbies are now deserted; and the work of inquiring into Private Bills is drawing to an end. Though there has not been much cream to be collected at Westminster this session, no one was particularly sorry to be relieved from attendance in the Committee rooms under the torrid conditions prevailing last week.

Coatbridge Gas. The Confirmation Bill containing the Coatbridge Gas Order was under consideration by a House of Commons Committee on Tuesday and Wednesday. The inordinate appetites of the Town Council for advantages from the Gas Company, together with the seductive advice of Counsel, brought them to Westminster once again; and their gains will not compensate the borough for the delegates' fares and hotel expenses, let alone the fees of Counsel and of experts. They altogether over-reached themselves. The Company have been well managed; and the only things the Council could lay to their charge were two or three past financial errors which the Company were quite ready to rectify. Then the Council wanted, in consideration of the reduction of the standard illuminating power from 20 to 15 candles, to knock something more off the standard price of 2s. 6d., though the Board of Trade had already removed the neutral zone, between 2s. 6d. and 2s. 11d. But with the increase in the price of material for producing 20-candle gas, the Company need some assistance; and this can be given them through the reduction of illuminating power without injuring anyone who uses gas in ways that are not obsolete. "The rock upon which the whole of the financial arrangements of the Company are founded," said Mr. Honoratus Lloyd, K.C., in a burst of eloquence, is the standard price of 2s. 6d. Investors in the Company at the present time are only getting an average return of 4·58 per cent. These considerations are sufficient to show the unreasonableness of the Council's request, and were quite sufficient for the Committee. The Council also wanted a calorific power test in addition to the illuminating power one. It was scornfully described by Mr. Corbet Woodall as "simply silly," and by Mr. Thomas Wilson, the Company's Engineer and Manager, as "a farce," to suggest its application to a small Company like the Coatbridge before the matter is more fully investigated and understood. They are not wrong; and it would have been simply silly of Parliament to have complied, and to have imposed a dual test. In this matter, Parliament has not shown any disposition to deserve the application of the contemptuous description; and it is hoped they never well. One standard of quality has been found sufficient for the past; and it will do for the future. When the major part of gas consumed was for lighting purposes and the minor part for heating, an illuminating power standard was sufficient. Now that the major part of gas is used for purposes in which its heating property is of moment, and a very minor part for purposes in which luminosity is required, one standard is still sufficient, and that one in due season will assuredly be that of calorific power.

A GERMAN TEXT-BOOK OF HYGIENE.*

We have received two sections of the handbook on hygiene, which has been compiled by Professor Prausnitz, the Principal of the Hygienic Institute of the University of Gratz, with the assistance of a number of collaborateurs. The handbook itself constitutes the eighth volume of Lehmann's Medical Cyclopædia, of which the earlier volumes are devoted to more purely medical subjects. The volume on hygiene consists in all of 24 sections, of which only the two now before us seem to treat of matters directly falling within the purview of the "Journal."

The first of these two sections, being the ninth section of the volume, deals with ventilation, heating, baths, and steam laundries. It is written by Herr H. Recknagel, an engineer of Munich, and comprises 60 quarto pages, with about 60 illustrations. The subject of ventilation is treated in a satisfactory manner, except that it is divorced from the treatment of lighting and heating. As, however, methods of heating and ventilating must be somewhat different in Continental countries where great extremes of heat and cold are more commonly experienced than in England, it is not fair to press this point against the author's judgment. Here we are able fortunately to depend very largely on our lighting and heating arrangements for the efficient ventilation, incidentally, of closed rooms. The subject of heating is handled very well in so far as steam and hot-water supplies to buildings are concerned, but the use of gas-fires is passed over in a few lines of which a large proportion refer to risks of fire and explosion which are known by world-wide and prolonged experience to be negligible. This summary dismissal of a means of heating which is advancing in popular favour and in the esteem of authorities on hygiene by leaps and bounds at the present time is unjust to it, and liable to mislead the reader of the text-book. In regard to baths, very little is said about methods of heating bath water; and we have not observed any mention of the use of gas therefor. This is a serious omission in what purports to be an up-to-date treatment of the subject.

The next section, the tenth of the volume, deals with "Lighting." It is written by Herr H. Metzger, a town councillor of Bromberg. Within the very circumscribed limits of 36 pages (a large proportion of which space is occupied by about 50 illustrations), we think the author has treated his subject well and fairly. He starts with natural lighting and the application of prism lights for improving the daylight illumination of cellars and dark rooms. The units of light and illumination are referred to; and we regret to see that the value of the Hefner is given as 0·877 English candle, notwithstanding the revised value of 0·913 adopted by the International Photometric Congress in 1907. In a general introduction to the subject of artificial lighting, a table is given of the volume of products of combustion, heat evolved, air consumed, and cost per unit of light of the more usual methods of lighting. Gas appears to be taken at the high price of 20 pfennige per cubic metre (5s. 8d. per 1000 cubic feet) and current at 60 pfennige (7½d.) per unit; and it is interesting to note that at these figures the cost of high-pressure gas lighting is less than one-fifth that of electric arc lighting. Also the heat developed is no greater than that of an ordinary carbon-filament lamp—per unit of light evolved.

There is a brief account of gas manufacture and the testing of the illuminating power and calorific value of gas. This is judiciously prepared, having regard to the compression of so large a topic into so small a compass. Street lighting, upturned and inverted incandescent burners and mantles, automatic lighters, meters, and a number of accessories of modern gas supply are next referred to. Then follows a three-page account of acetylene lighting, which is accurate and reliable. Electric lighting is then dealt with; and the section concludes with a tabular statement of the results of comparative testings of the illumination afforded by a variety of electric and gas street-lamps in Berlin and Charlottenburg. The authority for these measurements is not stated.

* Lehmann's Medizinische Atlanten, Band VIII. Atlas und Lehrbuch der Hygiene, mit besonderer Berücksichtigung der Städte-Hygiene. Herausgegeben von Professor Dr. W. Prausnitz, Vorstand des hygienischen Instituts der Universität Graz. Munich: J. F. Lehmann, 1909.

The New Home of the Electricals.

The members of the Institution of Gas Engineers will no doubt be interested to know how the Institution of Electrical Engineers are proceeding in the matter of their new home on the Victoria Embankment. Authority to purchase the property for £50,000 was given last year; and the purchase money has been provided by taking £24,000 from the accumulated funds of the Institution, and by a mortgage on the building amounting to £26,000. The entrance hall to the building is to be enlarged and improved, and the theatre is to be entirely rebuilt. There is to be a total expenditure of about £18,000 on the alterations to the building, and the equipment and furnishing of the library. The new theatre will, it is stated, be a very handsome one, and appreciably larger than that of the Institution of Civil Engineers, in which for some time the Electrical Engineers have been holding their meetings.

Combined Water-Gas and Tar-Carburetting Plant.—The Mid-Kent Gas Company have placed an order with Messrs. R. & J. Dempster, Limited, for a Dellwik-Fleischer water-gas plant, together with a tar-carburetting plant so arranged that the necessary enrichment for the water gas is obtained from the tar, which then becomes suitable for road-spraying. By this means, a two-fold purpose is accomplished; and the Contractors claim that with the combined plant gas having a calorific value of about 345 B.Th.U is obtained, and of such illuminating value that 20 per cent. can easily be mixed with coal gas without in any way reducing its candle power.

Engineering the Birkenhead Water Scheme.—In consequence of the death of Dr. George F. Deacon, who had been retained by the Birkenhead Corporation to carry out their Alwen water scheme, the Water Committee had to find another engineer. Shortly before his death, he had arranged a partnership between himself, his nephew (Mr. Martin Deacon), Sir Alexander Binnie, and Mr. W. J. E. Binnie; but it was never formally entered into. One was completed, however, between the three last-named gentlemen. Soon after this was done, the firm wrote to the Corporation offering to continue the arrangements of Dr. Deacon with them on the same terms; and at the last monthly meeting of the Town Council their offer was accepted. The scheme will be carried out as originally intended, and at the same cost.

Abandonment of the "Technolexicon."—It appears that the "Technolexicon" (the great German-French-English technical dictionary upon which the Society of German Engineers has been engaged for a number of years) has been finally abandoned. The material that had been collected by the Society was submitted some time ago to the Chief Librarian of the Technical High School in Carlsruhe. He examined this critically, and his report is to the effect that, while there are already on hand about 3,250,000 word-slips, only 0·3 per cent. are considered as fully completed. This material is not available as manuscript for the printer, and is classed by the expert who examined it as a rough collection of data awaiting preliminary arrangement. He recommended that it should be regarded as useful mainly for reference, and that the work should be started anew, upon a more limited scale, under expert advice. In view of the large sum already spent on the undertaking, and the many years that have elapsed since it began, the Society finally decided to drop the project.

IRISH ASSOCIATION OF GAS MANAGERS.

Annual Meeting in Dublin.

[From Our Own Correspondent.]

The members of the Irish Association of Gas Managers have a happy and sensible method of arranging for the technical part of the business at their annual meetings. They are nearly all managers of small works, in which large problems are not to be found. The works, too, are far from markets, both for purchase and sale. This has a cramping influence upon enterprise, and places limitation upon energy. Therefore the subjects dealt with by the members themselves are superficial to an extent which is not met with in Gas Associations on this side of the water. It is noticeable that the representatives of the larger gas undertakings stand aloof from the Association—an attitude which is inexplicable, in the light of experience elsewhere. So, being left alone by the leading lights in the industry, the members provide plain fare themselves; and for higher things, they engage a gentleman of skill to lecture to them. It was probably the late Hon. Secretary—Mr. James Whimster, of Armagh—who was responsible for the introduction of this arrangement. Whoever the author of it may have been, the policy is a very wise one. It was wise in conception; and in practice it works to the complete satisfaction of all.

The meeting which was held in Dublin last Tuesday conformed to the lines here indicated. Everyone anticipated that Mr. F. T. Eustace, of Tullamore, would make an excellent President; and the expectation was fully realized. Besides conducting the business of the meeting with an urbanity that was quite refreshing, he gave a Presidential Address which almost seemed to have been framed on the principle of making members wish for more. His leading subject—as was that of the succeeding paper, by Mr. H. W. Saville, of Drogheda—was the working of sulphate plant. The latter described an ingenious device which he has adopted for raising the temperature of the liquor; and the figures he gave were convincing as to Mr. Saville having found a simple and economical method of improving his position so far as regards sulphate. Mr. J. E. Enright, of Tralee, followed with a paper in which there was much homely comment upon familiar from day-to day business in the conducting of gas undertakings—a paper in which the author's opinions were so expressed as to elicit considerable discussion. This exhausted what may be termed the home bill of fare; and of it it must be said that it was all of a wholesome nature. The deeper subject introduced to the meeting was that of lighting by the inverted incandescent burner, upon which Mr. Henry O'Connor, of Edinburgh, lectured—giving, in short and easily apprehended compass, much useful information regarding the principles governing the most recently introduced method of lighting. It was certainly a lecture which will well repay study.

It was with regret that the Association received the resignation of Mr. Whimster, who was the founder of the Association, and who has served it as Hon. Secretary and Treasurer during its existence of twenty-three years. The reason for Mr. Whimster's giving up of office—the serious illness of his wife—added to the feeling of regret. The Association owe much to Mr. Whimster; and their recognition of this fact, in electing him an Honorary Member, was a quite commendable step. His successor—Mr. George Airth, of Dundalk—is a gentleman full of energy and devotion to the Association; and in his hands, there is every reason to expect, the Association will continue to serve a purpose highly beneficial to the gas managers of the Sister Isle.

The Annual Meeting of the Irish Association of Gas Managers was held in the Dolphin Hotel, Essex Street, Dublin, last Tuesday. Mr. F. T. Eustace, of Tullamore, the President, took the chair at 11.30 a.m., by which time there was a goodly gathering of members, augmented later by fresh arrivals.

The President said he was sorry to inform the members that their Hon. Secretary (Mr. James Whimster, of Armagh) was absent, on account of the illness of his wife; but Mr. G. Airth, of Dundalk, was doing duty for him.

Report of the Committee.

The Hon. Secretary (*pro tem.*) read the report of the Committee, in which it was stated that they looked back with satisfaction to the meeting held last year in Holywood. The papers and discussions were full of interest; and Dr. Colman's lecture on "The Effect on Practical Working of the Seals and Pressures in the Hydraulic Main and Retort" was most thoroughly appreciated by all. In furtherance of the decision come to at the last annual meeting, the Committee met in Dublin on the 30th of April, and made the necessary preparations for this year's meeting; at the same time preparing the circular which had been sent out to all the ordinary members, asking for nominations for office-bearers for the ensuing year. Two offices were not left open for voting; it having become an established custom that the Vice-President should be appointed for next year, and that the retiring President should be nominated to represent the Association on the Council of the Institution of Gas Engineers, provided he was eligible. Owing to the sudden and very dangerous illness of Mrs. Whimster in June, the Hon. Secretary was unable to carry to a completion the arrangements for the annual meeting. In view of the remarks made at the last meeting, Mr. Airth, of Dundalk, had kindly offered to give the Hon. Secretary any assistance he might require; and with the consent of the President, Mr. Airth had carried out the final arrangements. In conclusion, the Committee expressed regret at having to record the death of Mr. Harvey, of Belfast, who had been an extraordinary member for the last twelve years.

Report of the District Representative to the Institution.

The Hon. Secretary also read the report of the District Representative on the Council of the Institution of Gas Engineers (Mr. T. J. Reid, of Ballina), as follows:

I only attended two meetings of the Council of the Institution of Gas Engineers during my term of office as your representative on that body. The business transacted during the year was not of a nature to demand more frequent attendance in the interests of our Association. The chief incident during the past year was the death of Sir George Livesey, and the action taken by the Council of the Institution in promoting a Livesey Memorial Fund sufficient to endow a Chair at the Leeds University in the interests of the gas profession. The success attending the promotion of this fund, and the object its promoters had in view—"the perpetuation of the memory of a really great man, in a manner likely to benefit the whole industry"—are too well known to reiterate, further than to remark that the question of contributing to the fund might be considered worthy of our attention. There was one matter dealt with by the Council of the Institution which may possibly affect some of the members of our Association. A letter was received from the Master Printers and Allied Trades Association with reference to the restrictions upon the use of gas-steam radiators and other flueless stoves by the Factory Act, which, unless removed, would appear to place the use of such apparatus in opposition to the requirements of the Factory Inspector.

Auditor's Report.

The Auditor (Mr. G. W. Norman, of Dublin) read his abstract of the accounts, in which it was shown that the income for the past year was £106 3s., and that there remained a balance on hand of £66 17s. 10d.

Mr. R. Harrison (Monaghan) moved that all three reports be adopted.

Mr. J. E. Enright (Tralee) seconded the motion; and it was unanimously agreed to.

Resignation of the Hon. Secretary and Treasurer.

Mr. Airth read a letter from Mr. Whimster, tendering his resignation of the offices of Hon. Secretary and Treasurer of the Association, which he had held since the formation of the Association in 1887. He explained the circumstances (among them being Mrs. Whimster's serious illness) which had induced him to take this step, and asked the members not to re-elect him, but to request Mr. Airth, of Dundalk, who had kindly come to his assistance, to complete the year's work by editing and issuing the report of the meeting, and elect him or some other member to fill the vacated position. Mr. Whimster concluded by expressing his gratitude to the members for their long-continued confidence in him, and for the uniform courtesy and friendliness with which they had always treated him.

The reading of the letter was followed by appreciative remarks from several members on Mr. Whimster's services to the Association; and resolutions were passed expressing condolence with him in Mrs. Whimster's illness, and unanimously electing him an honorary member.

Election of Office-Bearers, Etc.

The President said the Committee reluctantly had to report that the ballot for the election of office bearers had not come up to their expectation—only one-third of the members having voted; and they felt that under the circumstances they should, as in previous years, recommend some names for selection.

Mr. G. W. Norman (Dublin) who had been one of the Scrutineers, said that from his point of view the ballot was thoroughly disappointing. A number of members were nominated for Vice-President, some of whom obtained only one vote, and for the

Committee about twenty names were proposed. What was more, some of the members voted for were not eligible.

After considerable conversation upon the subject, it was left to the Committee to devise a scheme for election; the view expressed by the speakers being that a list of names to be voted upon should be sent down to the members before the meeting.

The following were then elected to office:—

President.—Mr. R. Harrison, of Monaghan.

Vice-President.—Mr. J. Paterson, of Queenstown.

Members of Committee.—Messrs. J. F. Tyndall, of Wicklow; J. Brodie, of Lisburn; and J. Bradley, of Athlone.

Hon. Sec. and Treasurer.—Mr. G. Airth, of Dundalk.

Auditor.—Mr. G. W. Norman, of Dublin.

Mr. Harrison expressed the obligation he felt for the honour conferred upon him in electing him President.

Mr. Airth thanked the members for their election of him to the office of Hon. Secretary and Treasurer. No one, he said, regretted more than he did the circumstances under which they had had the opportunity of appointing him to fill the position.

Mr. Paterson returned thanks for his election as Vice-President.

Representative on the Council of the Institution.

On the motion of Mr. R. Bruce Anderson (London), seconded by Mr. C. W. Stott (Parsonstown), Mr. Eustace was appointed representative of the Association on the Council of the Institution of Gas Engineers.

Place of Next Meeting.

On the motion of Mr. Harrison, Belfast was selected as the place for the next meeting.

New Members.

On the motion of Mr. Paterson, seconded by Mr. Enright, the following were elected members of the Association:—

Ordinary Members.—Barnett, W. H., of Kells; Canning, J., of Balbriggan; Dunn, Matt., of Stockton-on-Tees; Gault, R., of Limavady; Hands, T., of Enniskillen; Scott, R., of Blantyre, N.B.; Woods, J., of Athlone.

Extraordinary Members.—Blair, P., of Birmingham; Blakeley, W., of Dewsbury; Donkin, C. Bryan, of Chesterfield; Duff, C. H., of London; Main, R. B., of Falkirk; M'Ewan, T., of Falkirk; Nuzum, L. L., of Dublin; Todhunter, C., of Belfast.

Members in Arrear.

The Hon. Secretary intimated that the following notice of motion for next year's meeting had been given: "That any member whose name is deleted through arrears of subscription shall have to pay 10s. on re-election." He explained that the bye-law provided that anyone who was three years in arrears fell out of membership; and what was intended was that on re-election he should pay up what he was in arrear.

Presidential Address.

The President then delivered his Inaugural Address, which was published in the "Journal" last week (p. 381). Two corrections, which were made upon it after the dispatch of the copy, have to be noted. Speaking of the capacity of the sulphate plant at Tullamore (p. 382, col. 1), the dimensions of the two stills should be 14 ft. by 2 ft.; and the acid solution is made up to 80° Twaddel at the start of operations.

Presentation of the President's Medal.

Mr. T. Frizelle (Holywood) moved that the best thanks of the Association be given to the President for his instructive address, especially in regard to his system of making sulphate of ammonia. Some of them knew that this added considerable profit to a gas undertaking. Any gas-works, however small—even those of 4 million cubic feet per annum capacity—he should say, ought to have some form of sulphate plant. It was now his pleasure, on behalf of the Association, to present Mr. Eustace with the President's Medal, and to express the hope that he would be long spared to wear it.

Mr. Harrison, in seconding the motion, said he considered the address was the very thing required in an Association such as theirs. He had received a great deal of instruction from it; and he thought every member present would benefit by the President's experience in the manufacture of sulphate of ammonia. He trusted some of them would be encouraged to do likewise.

The President expressed his inability to thank the members adequately for the manner in which they had accepted his address. It was not, perhaps, up to the quality of former addresses. At the same time he knew they had taken it in the right spirit; and he expected they would pass over his shortcomings.

Reading of Papers.

The reading of papers was then proceeded with. These were: "Experiences with a Small Sulphate Plant," by Mr. H. W. Saville, of Drogheda, and "Some Notes and Queries on the Control of Small Gas Undertakings," by Mr. J. E. Enright, of Tralee. The proceedings also included a lecture by Mr. Henry O'Connor, Assoc.M.Inst.C.E., F.R.S.E., of Edinburgh, on "Inverted Incandescent Gas-Lights." Mr. Saville's paper is given on this page, and Mr. Enright's on p. 446. Mr. O'Connor's lecture is unavoidably held over till next week.

Votes of Thanks.

Later in the afternoon,

Mr. R. Bruce Anderson (London) proposed a vote of thanks to the President for the able manner in which he had conducted the proceedings. The meeting over which he had presided had been one of the most successful in the history of the Association.

The motion was carried by acclamation.

The President thanked the members once more for all the kind things they had said about him.

Mr. Paterson thought it would hardly be appropriate that they should separate without proposing a hearty vote of thanks to Mr. Airth, who had stepped in at a very critical time, and had done much for the success of the meeting.

The vote having been heartily accorded,

Mr. Airth briefly returned thanks, and the proceedings closed.

The Dinner.

In the evening, the members and friends, including ladies, dined together in the hotel—Mr. Eustace presiding over a company of about seventy. The toast of "Prosperity to the Irish Association of Gas Managers" was proposed by Mr. Henry O'Connor, and duly acknowledged by the President. "Kindred Associations" was proposed by Mr. R. Bruce Anderson, and responded to by by Mr. R. G. Shadbolt. Mr. A. Mackenzie proposed "The New Hon. Secretary;" and Mr. Airth acknowledged the toast. During the evening, a musical entertainment, organized, as usual, by Mr. G. W. Norman, was greatly enjoyed.

The Excursion.

On Wednesday, a large party, numbering about ninety, went on an excursion, in the finest of weather, to the beautiful district embracing the Powerscourt Waterfall, the Rocky Valley, and the Dargle Glen. Luncheon was served at Enniskerry, and tea at Bray; after which one of the happiest gatherings under the auspices of the Irish Association broke up.

EXPERIENCES WITH A SMALL SULPHATE OF AMMONIA PLANT.

By H. W. Saville, of Drogheda.

[A Paper Read before the Irish Association of Gas Managers.]

On going through the published accounts of the Drogheda Gas-Works immediately after taking charge of the undertaking, I found, among other things, that the production of sulphate of ammonia was far from being satisfactory. My first business was to put the plant in operation, in order to see the method of working, and, if possible, to find out where the fault lay. The plant is only a small continuous one with a still 2 ft. 6 in. in diameter and 8 ft. high; the steam being generated by an independent vertical boiler.

The boiler would work up to 50 lbs. per square inch; but the pressure was kept intentionally low—working between 10 lbs. and 20 lbs. The supply of steam to the still was regulated by a $1\frac{1}{4}$-inch wheel-valve, necessitating constant attention in order to keep up anything near an equal pressure. The low temperature of the steam at the pressure at which the boiler was worked produced a very sloppy salt, of bad colour, and made a large quantity of mother liquor—in fact, every available vessel was full of this liquid, and a quantity had found its way down the drains.

At the first working, I found one very serious defect—viz., the draining-table, instead of falling to the saturator, inclined the opposite way. On inquiry, I found that when the table was cleared, the drainings were thrown out. No doubt the table was left by the makers in proper condition, but had settled in some manner, and had never been observed.

After completing the first batch of sulphate, I had all the stock cleared out, and made a careful examination of the whole plant. On taking up the boards in the sulphate store, I found that the drain into the well was completely blocked, and a few leakages in the lead floor accounted in some measure for the large quantity of acid used. After having the lead work repaired, the plant put together, and the draining-table re-set, I had a $1\frac{1}{4}$-inch reducing valve fixed on the steam supply, set at 15 lbs., so that at all times a constant supply of steam was assured. The steam-boiler was then worked at about 40 lbs. steam pressure, which, in figures, meant that the still was receiving the steam at a temperature of 267° Fahr., in place of 213°. The immediate result was that the salt was of a different nature and appearance; and the difficulty of the excess of mother liquor disappeared altogether. Financially, the result was that the production of sulphate was more than doubled, though a less quantity of acid was used.

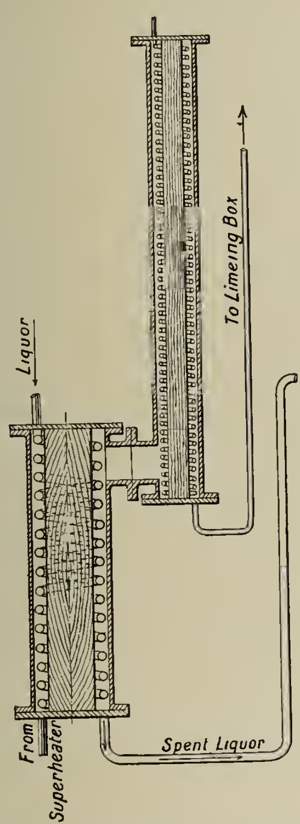
I was then, to the best of my belief, getting everything out of the still for its size that it was capable of producing; but yet I was dissatisfied with the small turnover, the high labour-cost per ton, and the fuel account. It seemed almost a misnomer to call it a continuous still. It was certainly not my ideal of a continuous still, which once started should need nothing but having the steam kept up and the supply of acid seen to; the liquor-feed should be constant, and require no adjusting.

To commence working the plant, we had to steam for four hours; and it would be fourteen hours before any salt was produced. Every time acid was put into the saturator, or lime into the still, the supply of liquor had to be checked until the temperature had been raised again; and at the rate at which we could turn liquor through the still, we could only make about 6 cwt. of sulphate in twenty-four hours.

After considering the question in all its bearings, I had a thermometer fixed on the liquor supply to the still, so as to have exact data on which to work, and had observations taken every few minutes for twelve hours. The results were very unsatisfactory; the maximum temperature being only 125° Fahr., running down to 100° Fahr. when liming, and to 105° Fahr. when charging the saturator with acid. The next experiment was to take the temperature of the spent liquor leaving the still, with a result that somewhat surprised me—the temperature being from 185° to 195° Fahr.

The natural inference was that there was more heat to be got from the waste liquor than from the superheater, if it could be utilized in any manner. The next difficulty was to overcome the drop in temperature when liming; and the only way to do this seemed to be by a constant feed of lime water. The working of the still by gravitation led me to try charging the still with lime in the same way, both having the same pressure to overcome.

I have now pleasure in describing the method I have adopted to overcome these difficulties, and the apparatus which is now in successful operation at the Drogheda Gas-Works.



Saville's Supplementary Attachment to the Drogheda Sulphate Plant.

The apparatus is purely supplementary, and does not alter or interfere with the existing sulphate plant. It consists of two cast-iron pipes, the lower one 1 ft. 1 in. in internal diameter and 4 feet long; and inside this is a coil of $1\frac{1}{2}$-inch steam-pipe, 40 feet long. Through this coil the whole of the heated spent liquor passes. The coil is surrounded by the liquor supplying the still on its way from the (so-called) superheater. The other pipe is 7 inches in diameter and 6 ft. 6 in. long. It contains a coil, 80 feet long, of $\frac{1}{2}$-inch steam-tube. Steam is connected to the coil which enters at the top. The object of the coil is threefold:

(1) To raise the temperature of the liquor surrounding the coils to upwards of 170° Fahr. before starting the still.

(2) To maintain this temperature so that at all times, and under all conditions, the liquor supplying the still is at an almost constant temperature.

(3) The steam and condensed water are passed forward to the elevated liming tank, where it both acts as an agitator and supplies a quantity of boiling water.

The supply of lime is continuous in quantity, and has an even temperature. In this manner, the whole of the steam used in the $\frac{1}{2}$-inch steam coil is utilized and returned to the still either in heated liquor or lime water. It will be observed that in both cases the liquor travels in the opposite direction in the chambers to both the spent liquor and the steam in the coils; so that it passes into the still at the desired temperature.

The two pipes forming the apparatus do not stand over each other. Originally, that was my intention; but on preparing a sketch, I found that it would be difficult to make the connections required. As at present fixed, we can easily (by taking off the flanges) get at any part of the plant, or take the coils out entirely for examination if necessary. All the joints are outside and in sight. Down through the centre of each coil is inserted a wooden core; the object of this being to reduce the space—thus having a smaller volume of liquor to heat and getting to work so much quicker.

I have had thermometers fixed at various points on the plant, so that the steam on both the still and the coil can be set to a nicety. The valves never need be touched until the plant is shut down.

We now get the still in full operation after having steam turned on for forty minutes, while we begin to fish in about $6\frac{1}{2}$ hours. The quantity of liquor passed is increased by 80 per cent. There is no anxiety about liming, which under the old pumping arrangements was apt to be neglected.

One result of using the apparatus is that, instead of working day and night shifts, as much salt is made during the daytime now as in twenty-four hours before; so the night-shift has been dispensed with. The plant takes so little time to get to work in the morning that the attendant can start practically where he left off the day before. In this way, one is able to give the personal supervision so necessary in small works, and which it is impossible to secure during the night.

I may here state that the quantity of steam used by the coil is infinitesimal; and the amount of steam required by the still is so much less that I am getting more than twice the return from steam as formerly—taking into account the increased flow of liquor. As a matter of fact, I have been enabled to dispense with one steam-boiler entirely.

Under the foregoing conditions, in my opinion, the bulk of the free ammonia is liberated in the top and second compartments of the still, leaving the remainder of the still to deal with the fixed ammonia. The spent liquor is now practically at boiling point when leaving, which in turn loses its heat to the fresh liquor. The salt produced is both drier and better in appearance, and will bear comparison with any produced in the best of plants.

The plant described is very simple in its application, and the cost is very low. It returned its first cost in a fortnight's working.

Discussion.

The PRESIDENT said he had followed the paper very closely, and considered that it just bore out exactly what he himself said. It was a pity that the managers of small gas-works would not adopt sulphate plant, because there was no doubt that, after a short time, it paid for itself. There was such a ready market for sulphate of ammonia that it was really a shame to see the liquor cast aside and not used. By the manufacture of sulphate they, of course, increased their revenue. It was not a very costly item; and in any case the liquor itself, if not worked, was actually a nuisance. In his own case, it was so much a nuisance that it cost them from £15 to £20 a year to cart it away outside the town. Last year they made over £40 net profit from sulphate of ammonia, and saved the other £20—a matter of £60 in all. This was, of course, a consideration. The cost of the plant did not exceed £300—he thought it was £287 altogether; so that the investment was paying very well. They were getting good interest upon their money, and they had abated a nuisance as well.

Mr. R. G. SHADBOLT (Grantham), in complimenting Mr. Saville on his contribution, said the effort he had made to deal with the sulphate plant in the condition in which he found it was an object-lesson which all young gas managers might take to heart. He well remembered on being placed in charge of different works, at various times, the extreme longing he had to sweep the decks, and to put in something up-to-date. If all young men were to adopt this line, as they were inclined to do, naturally, they should be able to give a better account of their stewardship. He should like Mr. Saville to give them the yield of sulphate under the conditions he found existing, the yield of sulphate under ordinary conditions, after he had tilted the draining table and stopped the leakages and the excess of mother liquor; and then the increased yield of sulphate after he had added to the plant the method of superheating—and regeneration, might he take it? It all really amounted to this, that he had reduced the use of steam and the waste of heat to the minimum. The successful manager, either in sulphate or gas manufacture, or any of the operations they were called upon to conduct, was not the one who could take 21s. out of £1, but the man who reduced the waste to the utmost minimum. They could not make more out of matter than was in it; but they could reduce—and Mr. Saville had gone on these lines—the waste, which was either dissipated in the atmosphere or which was lost in the ground, to the minimum. Therein, to his mind, lay the successful manager; and if Mr. Saville would continue on these lines, he (the speaker) ventured to predict for him a career which would, at any rate, not be unsuccessful.

Mr. J. PATERSON (Queenstown) said he worked a small sulphate plant—he should say somewhere about the same size as that of Mr. Saville. When he took charge of the works they had an intermittent plant, the results from which were very disappointing. They discarded this, or such portions of it as were found to be inadequate; and, by the introduction of a continuous still, they had materially improved the working results. While the paper was of great interest to all managers of small works who were manufacturing sulphate of ammonia, he thought it would have been of much more interest had Mr. Saville given a few figures such as had been suggested by Mr. Shadbolt. The author told them that the results were disappointing when he took charge

of the works, and that they had been very much improved; but they would have liked to have had a few figures. Perhaps Mr. Saville, when replying, would let them know the quantity of coal carbonized, the amount of sulphate made, the strength of liquor which he employed, the fuel used per ton of coal carbonized and per ton of sulphate produced, also the quantity of acid used per ton of salt made. He was rather surprised, not so much at a reference in Mr. Saville's paper, but in the address of the President, which was not open to discussion, though he would like to make a remark upon it. The President told them the fact that the results were very much improved by the reduction of the pressure on the still; but he did not give them the pressure on the still when he started work.

The President: We started with 15 lbs.

Mr. Paterson: And there was considerable improvement when it was brought down to 6 lbs. Strange to say, his experience had been the very opposite. He started with 5 lbs. on the still, and the result was somewhat similar to what Mr. Saville found, when he went to Drogheda, by increasing the pressure on the still. He (Mr. Paterson) might mention that he had two separate stills—one for the elimination of the free ammonia, the bottom part of which was the liming chamber. The overflow from this still gravitated into the fixed still. All the steam, with the exception of a little, was introduced into the fixed ammonia still. On this still he had to carry 15 lbs. pressure to get anything like good salt and to maintain the temperature necessary in the saturator. He had not two separate gauges—one for the fixed and the other for the free ammonia still. All the steam was admitted through the fixed ammonia still; and the gases flowing from this passed up through the free still. He would like to know what distinction there was between Mr. Saville's steam-boilers and the sulphate plant. Were they far removed? He himself had some trouble in this connection. His steam-boiler was fixed up in the retort-house, about 150 feet from the sulphate plant; so that he lost a considerable amount of heat. The temperature was very much reduced by the time it arrived at the sulphate plant. He carried between 45 and 50 lbs. of steam on the boiler.

Mr. R. Bruce Anderson (London), regarding the remark which Mr. Saville made about draining in the wrong direction, said that the very first time he went over to Ireland was about a sulphate plant with which there was some difficulty. The defect he found out was that the off-take, instead of draining away from the saturator, was draining back to it. Nobody looking into the sulphate-house would have seen that the pipe was draining in this direction, but would have thought it was away from the saturator. It was merely an optical illusion. The mechanic who put it up no doubt thought he had drained it away, but, as matter of fact, he had drained it back to the saturator. The mere introduction of liquor into this pipe solved the whole difficulty. The idea Mr. Saville had suggested, of working the lime into the still by gravitation, was, he thought, a very useful discovery on his part. They had either to have a very small pump, or a large pump working at long intervals. The wear and tear on the lime pump was of considerable amount; and if the lime could be successfully run in by gravitation, it would affect the item of wear and tear, which was well worth consideration. As to the size of works sulphate plant could be profitably introduced into, he had very great doubts whether it was worth fitting up plant in works producing under 5 million cubic feet; and even then they would find that the wear and tear hardly warranted its introduction. The President talked of his plant having cost £300, and having had it in use for three years. Already, he understood, he had had to renew part of his superheater. He saw a number of Dellwik plants that had gone out of use, which either were not worth repairing, or the men in charge did not know what to do. Sulphate plants were liable to get out of order. They had no use for them for perhaps three months out of the twelve; and what with expansion and contraction, the wear and tear was very considerable. With regard to steam, he should say that the higher the temperature they could get steam the better.

Mr. W. E. Young (Tipperary) pointed out that Mr. Saville had not stated which way he admitted steam to the saturator. In his experience of sulphate of ammonia making, he lifted the carboy over the tank, and simply emptied the contents in. He was talking to a manager recently who had adopted the steam method, but had to give it up. This manager asked him if he could recommend any good way of getting the sulphuric acid into the overhead tank. He understood how the President did it; but he wanted to know how Mr. Saville did it. Did it make a difference in the strength?

The President: No, it does not; there is no steam wasted with the injector to interfere with the strength of the sulphuric acid.

Mr. T. Frizelle (Holywood) thought it would not be difficult to get the sulphuric acid a few degrees stronger from the makers. He had got acid stronger before now, with very good results.

Mr. Saville, in closing the discussion, said that one speaker had asked why figures were not given as to certain things. It was difficult for him to give figures, for the simple reason that he worked the liquor of two other works as well as his own, and he had great difficulty, therefore, in getting at the production per ton. So far as he could make out, when he went to Drogheda, the make of sulphate was about 12 lbs. per ton of coal used. After he put the draining-table right, he was getting about 25 lbs. of sulphate per ton, which, he considered, with the plant he had, was pretty fair. He had not had a full year of the latest arrangement; but he thought that he was now getting well on to 30 lbs. As a matter of fact, he had already, since March, made more sulphate than they did in the twelve months before he went there. He thanked Mr. Shadbolt for his kind remarks. His own liquor he worked about 5° Twaddel. If he worked up to $7\frac{1}{2}$°, he found that he was losing a certain amount of ammonia; and so he kept down to 5°, and practically got all there was out of it. He was rather surprised at the remark about the increase of steam, because he found that, unless he increased the steam very carefully, he got the saturator full of mother liquor. As a matter of fact, he was working with about 2 lbs. of steam in the still. So far as he could get at it, the quantity of acid used was about 2000 lbs. per ton of sulphate, which was a good return. He found that the steam, in working through the coil, was not sufficient to agitate the liquor; and he had to put a little extra steam into it. They would note that he said he got up the heat of the liquor, before entering the still, to 170°. He did heat it up to over 200°; but he found he was evaporating all the liquor, and that there was nothing in the top chamber of the still to seal it. So he found that he could not get any good returns over 170° on the coil. As a matter of fact, he could boil it out. Therefore he put a little steam in, so as to keep the lime in a milky condition. The still was only 8 feet from the steam-boiler. The different parts of the plant were all closely allied the one to the other. He had no injector for the acid. In the works he was in before, he had the experience Mr. Paterson had had—the acid was so much weakened that he had to keep putting fresh acid from carboys into the saturator to keep it up to working strength. He decided that he would never use an injector again. Of course, an injector, if it did not weaken the acid, was the best way; but he had to take the acid of the strength he could get it. He thanked the members for their kind attention. There were a lot of experiments included in the paper which would not interest them. He had many failures before he got success; and the paper he had laid before them was more or less the outcome of these failures.

SOME NOTES AND QUERIES ON THE CONTROL OF SMALL GAS UNDERTAKINGS.

By J. E. Enright, of Tralee.

[A Paper Read before the Irish Association of Gas Managers.]

The requirements of the gas consumer are changing; and we must alter the terms and conditions of supply to meet such requirements and demands for a better and more economic light and fuel. We have all of us to meet competition in some form, whether it be from electricity, petroleum, or producer gas plants; and in some cases all three have to be met with. Although some of the matters I purpose dealing with in this paper have been dealt with at recent meetings of our Association, still they are of such an important nature that I make no apology for enlarging on them, and trust the paper may at least be the means of promoting a valuable discussion.

Competitors with Gas.

To my mind, one of the most serious opponents that we in small provincial towns have to contend with in lighting is undoubtedly petroleum. How often will it be found in such towns that there are almost as many shopkeepers burning oil as there are using gas? How often also will one find both oil and gas being used in the same shop; and, more often still, gas being used in the shop and oil in the remaining portion of the house? The same remarks apply to the number of oil and coal stoves that are being used for heating and cooking purposes. How best are we to meet and grapple with this competition? I should say by adopting the prepayment meter system, free piping and fittings, by using more modern and up-to-date business methods than is our wont to do by not being content with what has been done, but seeking to develop our present resources; and also by looking ahead for fresh fields for our enterprise. In a word, by putting the advantages, the cost, and all else we claim for gas, whether for lighting, heating, cooking, or power purposes, before the public with all the intelligence at our command.

Is the penny-in-the-slot meter as popular as it might be? If not, what is the cause of it? On looking over the "Gas World Year Book for 1909," one cannot fail to be struck by the amazing difference in the price charged to prepayment consumers when compared with that charged for cooking purposes to the ordinary consumer, notwithstanding that at least two-thirds of the gas used on the prepayment system is for cooking. The table on next page will serve to illustrate the anomalies to which I refer. In the table, it will be noticed that I have assumed 12,000 cubic feet per annum as being a fair average consumption by the prepayment consumer, and have taken two-thirds of this amount—viz., 8000 cubic feet—as being used for other than lighting purposes. This average I consider conservative, as my own experience in working results in an average of over 16,000 cubic feet per annum. It may also be well to point out that, in the cases which I have selected for comparison, the additional price charged to prepayment consumers has not been taken into account.

I presume any of the undertakings in the table (p. 447) would be well pleased to have a few hundred extra consumers, who would each consume 12,000 cubic feet per annum, and sell it at their

—	Lighting Price per 1000 C. Ft. Ordinary Consumer.	Cooking Price per 1000 C. Ft. Ordinary Consumer.	Difference per 1000 C. Ft.	Amount of Difference per Annum on an Estimated Consumption of 8000 C. Ft. for Cooking.	Amount of Difference per Annum on the Total Estimated Consumption of 12,000 C. Ft.
	s. d.	s. d.	s. d.	£ s. d.	£ s. d.
1	6 8	5 10	10	6 8	10 0
2	5 6	4 4	1 2	9 4	14 0
3	5 5	4 2	1 3	10 0	15 0
4	6 8	5 0	1 8	13 4	1 0 0
5	4 2	3 4	10	6 8	10 0
6	6 8	4 2	2 6	1 0 0	1 10 0
7	6 8	5 0	1 8	13 4	1 0 0
8	5 3	4 3	1 0	8 0	12 0
9	5 7	4 9	10	6 8	10 0
10	5 9	4 6	1 3	10 0	15 0
11	5 0	4 0	1 0	8 0	12 0
12	5 6	4 5	1 1	8 8	13 0
13	6 8	5 10	10	6 8	10 0
14	5 0	4 0	1 0	8 0	12 0
15	4 3	3 4	11	7 4	11 0
16	5 0	4 2	10	6 8	10 0
17	3 9	2 8	1 1	8 8	13 0
18	6 0	5 0	1 0	8 0	12 0
19	7 0	3 0	4 0	1 12 0	2 8 0
20	6 3	4 7	1 8	13 4	1 0 0
21	6 8	4 2	2 6	1 0 0	1 10 0

special cooking rate. Surely if this can be done, and a profit earned at the price named, it is quite evident that gas can be sold to the prepayment consumer at the same price as that charged to the ordinary consumer for lighting, notwithstanding all that has been urged to the contrary. How, then, is the additional charge justifiable? It seems to me that the method heretofore adopted, of fixing the additional charge on the ordinary selling price, is altogether at fault. For we must remember that the prepayment business is of our own making—that it is an auxiliary to our ordinary business, and that it was adopted as a means to an end. Hence every possible inducement and encouragement should be offered to probable consumers, as an increased output generally tends to reduce manufacturing costs. Indeed, there are few undertakings in Ireland that could not afford to increase their output by a few million cubic feet annually without in any way increasing their manufacturing charges—viz., management, carbonizing labour, and rent, rates, and taxes. Especially would this be so in the case of the gas used by the prepayment consumer for cooking purposes, as it is generally a day load, and almost invariably a summer consumption. Under these circumstances, the basis of calculating the price to be charged should be the net cost of the gas into the holder.

Let us assume a case in which the cost into the holder is 1s. 3d. per 1000 cubic feet, with an average consumption of 12,000 cubic feet, and the cost of installation £5, to be recouped (say) in ten years. The annuity on this amount, at 10 per cent., would be 10s. per annum, or 10d. per 1000 cubic feet. This, added to the cost into the holder, would make a total net cost of 2s. 1d. per 1000 cubic feet; so that anything over and above this would represent profit. Consequently, with the price of gas at 5s.—and this is a fair average for Ireland—it would mean a profit of 2s. 11d. per 1000 cubic feet. It can scarcely be denied that this would allow for a reasonable profit, after meeting the other proportionate capital charges for distribution, maintenance, &c., that should also be charged to this account. In all the cases cited, it will thus be seen that the difference between the price charged for ordinary and for cooking purposes is more than sufficient to redeem both capital and interest on an average consumption of 12,000 cubic feet. *En passant*, it is important to remember that by free fittings is not to be understood the wholesale fitting of houses, but rather the supplying of a plain, substantial bracket or pendant in kitchen, dining-room, and hall, with cooker and meter; the discretion of the manager to be used as to the merits of individual cases.

The importance and advantages of incandescent lighting cannot be too forcibly put before the public. A most important point, however, for a manager when adapting himself to push incandescent lighting is first to obtain the burner most suitable to his district, the quality of his gas, and the consumption per hour; for, as we are all aware, there are innumerable cheap and worthless burners on the market, some of them consuming 6 to 7 cubic feet per hour, and not yielding anything like the light to be obtained from genuine burners of recognized makers, which, while only consuming 3 to 4 cubic feet per hour, will give a light of from 70 to 100 candle power. All incandescent burners, whether upright or inverted, should be fitted with both gas and air regulators, and of a kind to take standard size fittings, mantles, globes, &c. Armed with a burner of this class, the manager has in his hands an article that he can with confidence recommend to his consumer, and which can compete, light for light, with any other known form of lighting.

Future Policy of Gas Undertakings.

It thus behoves us to consider from every aspect how best to further, from a commercial point of view, the interest of the industry which we have so much at heart. The future policy of a gas undertaking must be an enterprising one, offering the best possible service to the public at the lowest price, doing more for the consumer than heretofore, and endeavouring to prevent our consumption coming to saturation point; for when that is reached, it means the practising of so-called economies. It is an admitted fact that no business was ever built up or successfully maintained on such a policy.

I am strongly of opinion that the time has now arrived when all gas undertakings, be they company or municipal, should adopt the erection, maintenance, and supervision of consumers' fittings. A show-room, displaying the most modern gas appliances, fittings, &c., also greatly tends to enhance the popularity of gas, as a well-arranged display is undoubtedly the most effective advertisement, and will win over consumers when any amount of argument or canvassing would fail. These, beyond any doubt, would give a great impetus to the sale of gas, and at the same time enable the consumer to have his fittings erected, and his alterations or repairs carried out, at a cost much less than that which is generally incurred, with, besides, a guarantee of entire satisfaction. This is only natural to expect; for if the work is carried out by the gas undertaking, it does not finish when the fitting is completed. It is also to our interest to see that the fittings used are of the most suitable kind for their various purposes. How often do we see the fittings and connections from the meter totally inadequate for the number of lights they were even originally intended to supply? How often do we see incandescent burners on fittings totally unsuited for use with such burners? How often, also, will one see them, when alight, with the gas flaring over the mantle, and not giving as much light as a good candle?

These are only a few of the many disadvantages from which the consumer would be relieved by a properly supervised fittings department under the control of the gas undertaking. The establishment of such a department does, and would no doubt, meet with powerful opposition from some quarters. Contractors would probably feel piqued at what they would consider an impudent infringement of their rights. The general public might view the arrangement with scepticism—perhaps believing it to be only another means towards securing additional profit, and not calculated to benefit the consumer. This is certainly a fallacy; for while the advantage would be mutual, as far as the consumer and the gas undertaking were concerned, the consumer would, nevertheless, have the greater gain, for it would be the bounden duty of any soundly-worked undertaking, where money was not actually lost in the fittings department, to give to the consumer not alone the full benefit of such a department, but also an indirect participation in the profits. Not alone would there be a better light, but there would also be increased sales; and with increased sales would go hand in hand a reduction in the price of gas.

The consumer would soon come to realize that, by a hearty co-operation with the gas undertaking, he was not only having his work cheaply and satisfactorily done, but that he was getting the maximum benefit at the minimum cost. It would then not be a very difficult matter to convince consumers of the merits of the various appliances adaptable to the use of gas. How is this to be accomplished? In the case of a company, it ought to be an easy matter to convince the directors of the necessity of establishing their undertaking on sound, commercial business lines, by adopting the most up-to-date business methods of increasing the sale of gas and enhancing the value of their property.

With an undertaking controlled by a municipal authority, however, it is a very different matter. You are met with the argument against municipal trading. Why this should be, I fail to understand. Have they not already to some extent adopted municipal trading, when they assumed the control of the gas undertaking? I also fail to understand why this argument is used almost solely against the gas industry. Have we not the trade organizations of the country asking for municipal workshops? And have we not the local labour bodies, through their representatives, demanding direct labour from the county council? It seems to me altogether unreasonable to declaim against a gas undertaking for fitting everything connected with the commodity that it supplies—in fact, the one is so closely identified with the other that they form as it were but one industry. The fitting indeed is of vital importance, for where that is defective the gas, however good its quality, is generally unjustly blamed. Are we not, alas, too familiar with the complaint "the gas is bad," when on investigation it is found that, in 90 per cent. of the cases, it is the fittings that are at fault? Such complaints as these, however unfounded, become an insuperable difficulty in the way of canvassing new consumers, and hence a very great barrier to the success of the gas industry. There is no justification whatever for the generally urged platitude that it would injuriously affect local labour. On the contrary, it would but tend to increase labour by enlarging the field of operations—that is, by extending the use and application of gas. It might, it is true, minimize the profits of the local contractors in this branch of business; but then the public good is always to be considered before the interest of the individual, and the universal boon that would be conferred on the public by this system would be sufficient vindication of its adoption.

Producer Gas as a Competitor with Coal Gas.

That producer gas is a keen competitor with town gas for power purposes, none of us can deny; and it is, moreover, a fact that those who control gas undertakings cannot afford to ignore. There seems to be a feeling among most of us that it is practically useless and hopeless to compete with producer plant. No doubt at first sight this would seem so, when we read the glowing statements and ofttimes misleading estimates, which are put forward

by the manufacturers of such plants. On closer observation, we may well ask ourselves, Are we so hopelessly out of the competition as those manufacturers would fain make us believe? As one who had a special opportunity for closely and practically investigating the question, I certainly say we are not, and that for engines up to 30 or 40 H.P. competition can still be met, according to local circumstances. The convenience and reliability of town gas alone has a very important bearing in making comparisons as to cost, &c. This is a subject in which managers of small gas undertakings must be well posted, if they are to successfully grapple with competition from this quarter. The statements made by plant manufacturers appear sometimes so plausible that, if we are not thoroughly conversant with the different aspect of the question, and ready to state our case intelligently by pointing out the many disadvantages of the producer plant as well as its advantages, it will be very hard indeed to convince the consumer, who very often loses sight of the following points:—

1.—The uncertainty of supply.
2.—The extra attention to cleaning the working parts of the engine that come in contact with the gas.
3.—The extra cost of attending to the plant.
4.—The extra cost of repairs—a very considerable item.
5.—The extra cost of engine, electrical ignition, &c.
6.—The cost of town gas supply, meter, &c., to connect up to engine as a stand-by, and for starting purposes.
7.—The extra capital involved in the installation of the plant, and engine foundations for both, together with interest and depreciation.

Without doubt it is a very serious competitor, and therefore we must ask ourselves how best to meet it. In this, as in other matters, prevention is better than cure; for if we are going to compete with this rival, it is far easier to keep it out altogether than put it out when once installed. Exceptional circumstances require exceptional methods; and it appears that the only solution to this difficulty lies in the fact that we must reduce the price of gas. We in small works are most advantageously situated in this respect, having regard to reserve of manufacturing plant at our disposal, enabling us to reduce the price to exceptional consumers. If we can supply public lighting at a reduced rate, as most of us do, why not deal similarly with such consumers? I think we could do worse than follow the lead of that pioneer undertaking in the gas industry (the Manchester Corporation), and offer to exceptional consumers gas at wholesale prices for a specified consumption, rather than leave any avenue open to our rivals of which they are only too ready to take advantage.

I know of two producer plants—one of which has been working for over two years, the other lately erected by a consumer whose average consumption was about 160,000 cubic feet per annum. The latter, to drive an engine of 13 to 14 H.P., was erected to supplant gas lighting by generating electric current for lighting and power purposes. The consumer was interviewed; but having a preconceived prejudice in favour of electric lighting and producer gas plant, argument was useless. As the electric load will be intermittent and batteries necessary, I am fully convinced that this consumer will yet get discouraged at lighting up the generator for a one or two day run per week, and will eventually fall back on town gas, for which a service and meter have been erected. But the former case is a more serious loss; being that of a large manufacturing firm whose yearly consumption averaged 750,000 cubic feet. This firm, in the first instance, had a 17 H.P. engine working on town gas. Requiring more power, and being convinced by the makers of a producer plant that they would effect an enormous saving as compared with the cost of town gas, they put in a 30 H.P. plant and engine. After the first year's working, their bill for town gas was, however, larger than ever. This was encouraging news; but, unfortunately, too good to last, as it proved to be. On investigation, it was found that, in order to drive the whole of the machinery, town gas had to be resorted to, as sufficient power could not be derived from the producer plant. It then became necessary for them to consider the erection of a larger plant and engine. After repeated interviews, this consumer, who had been using the plant for over two years, agreed to the following comparative table of costs, after a series of tests per one week running in each case.

Town Gas.	£	s.	d.	Suction Gas.	£	s.	d.
17,600 cubic feet at 3s. 4d. per 1000, as per meter reading	2	18	8	22½ cwt. of anthracite at 30s. per ton	1	13	9
				Attendance (actual time only)	0	12	0
				1000 cubic feet of town gas for starting purposes .	0	3	4
					£2	9	1

NOTE.—To this must be added interest and depreciation on the plant. The cost of repairs, which in this case amounted in the first year to £15, and in the second year to over £60, and of which no account has been taken in making these comparisons.

As a result, a reduced price of 2s. 11d. per 1000 cubic feet was mentioned, which this firm were willing to pay, and which would have left a substantial profit to the gas undertaking. The governing body of the undertaking refused to entertain the proposal, with the result that the consumer was lost to town gas who, with the additional power required, would now be using approximately 2 million cubic feet per annum. To supply this power, a 60 H.P. suction plant and engine has now been erected.

ADVANTAGES OF GAS ASSOCIATION MEETINGS.

To the general public and gas consumers—aye, and even to directors of companies and members of gas committees—these meetings of our Association may, and I presume do, appear of little value except to those who attend them. To us managers of small undertakings, they are of very great importance and advantage, not alone to us, but more especially to the undertaking whom it is our lot to serve. We pride ourselves, and justly so, on the greatness and importance of the gas industry, on the progress that has been attained, both in the process of gas manufacture and in its application commercially. But can we pride ourselves on our position? Has our status as a body advanced in any degree proportionately to that of the industry we have the honour to represent? I fear the answer must be in the negative; for while the undertakings which we serve reap the fruits of our conferences, they stand altogether aloof when there is a question of contributing financially to the success of our Association. Not alone do they not allow a manager's expenses on such occasions, but they look upon his absence as a kind of holiday.

Surely this is a grievance that requires to be redressed. If the undertakings were not willing to allow the expenses of the manager while attending the meetings of the Association, which they might reasonably do, as the meagre salary of many managers can ill-afford to meet the payment, they could at least contribute a fixed sum annually to the Association. A fund would thus be formed, out of which the expenses of the annual meeting of the Association could be defrayed. This would enable many managers to accept the presidency of the Association, who may now be compelled to refuse it, owing to the expense which it necessarily involves. It would, moreover, be a decided boon to many of the small undertakings, as meetings of the Association could then be held in many of the provincial towns, and the visit of the members on such an occasion would give a great fillip to the local undertaking.

RELATIVE POSITION OF DIRECTOR, MANAGER, AND SECRETARY.

With regard to the position of manager, especially in small undertakings, so much has already been said and written on the subject that it might seem superfluous to introduce it here; but it is a question with so many aspects, and concerning which there are so many grievances, and, above all, for which so little practical good has been done as regards ameliorating of the position of manager generally, that a few remarks may not here be out of place. It seems to me that, even among directors and members of committees of gas undertakings, a vague indefiniteness exists as to the authority, scope, and responsibility of a manager. Of the latter, indeed, he generally gets more than his share, having regard to the manner in which his authority and the scope of his operations are restricted, especially so in the case of municipal gas managers. "One who manages; one who has the guidance or direction of anything; one who is directly at the head of an undertaking." This is the position of a manager clearly and concisely defined according to authorities on the English language. Does this definition apply to the position and authority of a manager as universally recognized in our profession? I am aware that in a great many cases it does not. Instead of being directly at the head of an undertaking, in which case his advice would be sought for and generally acted upon, he is more often called upon to carry out the directions of the governing body, from whose deliberations he is ofttimes altogether excluded—and this, too, where his opinion and experience would be of the utmost importance. It also frequently happens that while the manager may be consulted when matters purely technical are under discussion, yet when there is a question of finance or the like, he is either mistrusted or overlooked, as if his opinion were not worth having. It would be difficult, if not impossible, to find a parallel to this mode of action in any other commercial business. Who should be more competent than the manager to advise, direct, and suggest in everything pertaining to the undertaking of which he is at the head? And though he may be somewhat lacking in financial acumen, still his practical knowledge and varied experience will often make amends for this, and should in any case be of great assistance to either directors or gas committees in their deliberations.

It also frequently happens that the secretary—who may not have, and generally has not, any technical knowledge whatever (that is, where his position is distinct from that of manager)—is often admitted into such deliberations and consulted about matters altogether within the province of the manager, thereby causing the former in many cases to circumscribe, if not altogether to usurp, the authority of the latter, and thus cause friction, which considerably militates against the success of the undertaking. Indeed, I strongly incline to the opinion that many of the grievances under which managers labour are traceable to this source. This is undoubtedly the cause of the almost universal grievance of the manager being unable to obtain access to the accounts generally, and other details and particulars with reference to the working of his department.

It appears to me that one of the first duties of a director or other person occupying a position of authority or responsibility in connection with the gas industry should be to make himself fully acquainted with the rights and privileges conferred, as well as the duties and obligations imposed, upon the manager of a gas

ıdertaking. Fortified with this knowledge, he would readily ıderstand that it is of primary importance that all the accounts, which the manager should at all times have ready access, ıould be so kept as to enable the manager to obtain at any time ıe correct cost and working results of the undertaking. If such not the case, it is almost impossible for the manager to know hat branch of the undertaking is unprofitable or extravagant.

To the manager, it is of little importance whether he serves ıder a board of directors, a municipal authority, or associated ıanagement, provided his position is an improving one, which ›me hold to be more often the case in the latter service, though ıis is a debatable point.

Gas Managers in Municipal Service.

This brings me to what I consider a very important point—viz., ıe service of managers under municipal authorities. It is hardly ecessary to point out that the appointment of managers in such ıses is not subject to the sanction of the Local Government oard, and he is not therefore strictly an officer of the council or ›rporation. Why is this? Is it that his position is so unimpor- ınt as to be unworthy of the notice of the Local Government oard? To me it seems so; for are not the appointments of the ›wn clerk and his assistant, the town surveyor, rate collectors, ıedical officers of health, executive sanitary officer, and even ıb-sanitary officer, subject to such sanction? Surely his depart- ıent, whether considered from a financial point of view or from ıe benefits it confers on the ratepayers generally, is not the least ıportant, nor is his position the least responsible. While the ocal Government Board will not set its seal upon his appoint- ıent by requiring its sanction, its auditors will, nevertheless, ırcharge or question expenses incurred by the manager when ı the discharge of his duty, and which have been unanimously oted by the council. I merely touch on this matter here in the ope of hearing the views of other members of the Association n the subject, which I have not heard discussed before.

I cannot claim for my paper any merit as to originality, much ›ss style. As I pointed out in the beginning, I have but en- eavoured as it were to sow the seeds of a few stray thoughts, hich I hope will bring forth a fruitful harvest of very valuable iscussion.

Discussion.

The President said the paper raised many points of interest. le certainly agreed with the view Mr. Enright took with regard › the position the gas manager occupied. He should occupy ıe same position as any other official did.

Mr. J. F. Tyndall (Wicklow) said that, in the beginning of his aper Mr. Enright spoke as to the charges for gas. This was a ıatter he felt strongly upon, and had something to say about in paper he read the year before. He must congratulate the uthor on the figures he obtained. It was a yield which was very reditable. The figure of 12,000 cubic feet, which he assumed, e could not accept. His own figure was nearer 9000; and on his he must base any arguments he had to make regarding the ustifiability of the extra prices which were put upon slot-meter onsumption. Mr. Enright said that he assumed the figure of 2,000 cubic feet, and asked how the additional charge was justi- iable. He thought that an extra charge was very justifiable or the capital outlay which was necessary for this class of con- ›umer. It was an utter absurdity to say that the ordinary con- ›umer should be treated on the same terms as the one they had o lay out a capital of £5 to get. It was only fair, he considered, o the ordinary consumer, who had been connected with the ındertaking ever since it was in existence, that any extra charge which was necessary to gain a new customer should be propor- ionately borne by the new consumer. Mr. Enright said that a to per cent. annuity on £5 amounted to 10s., or 10d. per 1000 cubic feet, which he added to the cost of gas into the holder. Why did he not apply the same argument to the ordinary con- sumer? If it were not for the ordinary consumer, how could they have the plant to deal with the slot consumer? Somebody must begin it. Why not apply the argument to both? If gas cost 1s. 3d. into the holder, and they could be assured of a consump- tion of 12,000 cubic feet for each consumer, why did he not con- sider this sufficient? They could get new consumers at too dear a cost; and he considered that, on the terms stated in the paper, the slot consumers were too dear. In his own case, 9000 cubic feet was the average. This represented, on his present rate, 50s. 6d. Taking from this the 10s. which Mr. Enright allowed as an annual instalment, he was left with 40s. 6d., which, divided by the 9000, gave him 4s. 6d. per 1000 cubic feet. Yet he was charging ordi- nary consumers 4s. 11d. for light, and 4s. 7d. for other purposes, which was 4s. 9d. all round, *plus* meter-rents. With the exception of this, he could very readily agree with most of the paper. He thought it was to the interest of the undertakings in which the members were engaged that they should have their expenses paid when attending Association meetings. There was hardly a member attending the meetings who did not go back with some ideas he had not entertained before. In his district, they pushed business on the same lines as Mr. Enright advocated. They paid just as much attention to the commercial aspect of the selling of their gas as they did to the manufacture. They advertised locally; they offered free facilities for cookers and slot installations; they kept a staff of fitters to attend to complaints; and they undertook practically everything from the manufacture from the coal to the consumption of the gas. He thought this was the proper position for every manager to take up, whether he served a municipality or a company. In regard to suction-gas plants, they were very often inclined to look too much upon the fact that town gas was high-priced, and to give up the fight. Mr. Enright enumerated seven different items which had to be taken into account in con- nection with producer plants. There was one such plant in their town which had been running pretty successfully during the last two or three years; but now, for the first time in two years, the owners of the plant were drawing a supply of gas from them. It was at the end of two years' running that any real difficulty was experienced with producer gas plant. In the case he referred to, they had to instal a very elaborate set of accumulators; and he had been told that the interest on the cost of this was more than their gas account used to be for twelve months.

Mr. H. W. Saville (Drogheda) said, so far as the Irish Local Government Board were concerned, he would just as soon not be an official under them. He had an instance in point. They had a Gas Act; and one of the clauses of the Act provided that they must order their accounts in accordance with the Gas-Works Clauses Act. The Local Government Board Auditor said: "This is the style I want." They showed him their Private Act; and he then said: "You can make them in that way if you like; but you must also make them in accordance with ours. I will not audit your accounts." The question arose as to the power to sur- charge an officer who had not been appointed, or whose appoint- ment was not confirmed, by the Local Government Board. He went about the matter to their Solicitor, who said: "If your Board are prepared to fight, I will fight it." This was a position which required clearing up; and he thought they were in just as good a position as if they were under the Local Government Board.

Mr. W. E. Young (Tipperary) thought they were themselves responsible for a good deal of their grievances. Though they had the meetings of the Association, there was considerable lack of organization among them. For instance, in some works the manager had what might be called a manager's duties; in other places, he was a mere lackey, if he might use the expression. There was also the question of salaries to be paid. An organi- zation such as theirs, in conjunction with larger organizations, should be able to lay down a scale of fees and duties which they, as members of the Association, could subscribe to; and he believed, if this were done, their lot would be better—and not their lot only, but the lot of those whom they served, because it stood to reason that if their employers got a man at a cheap figure they must expect inferior service. It should be within the pro- vince of such societies as theirs to formulate a scheme to define a manager's duty, and also to define his salary. He believed this would be good for the industry in general. He was not labouring under any grievance himself, but was judging by the numerous advertisements which appeared in the gas journals from time to time, in which they had gas-works of 60 or 70 million cubic feet offering £100 per annum. How they got men to take such posi- tions was surprising. This should be considered by their own and other societies, with a view to its being put a stop to.

Mr. Matt. Dunn (Stockton-on-Tees) considered that in many ways Mr. Enright said identically what probably most of them who had an inclination towards progress and the advancement of their own particular industry would have said. He (the speaker) had no desire to enter into the dispute about prepayment meter rental as compared with charges by ordinary meter. The author had dealt with the subject in a fairly reasonable way. What he wished to mention had reference to gas-burners. In recommend- ing burners to their consumers, they must always make it a point to put forward the very best they knew of. The best was really the most economical. He was pleased to see the reference to the regulated burner. They could not do too much in this line. He challenged their foes to show what they could do; and it was astonishing what he could do with a few burners, properly con- trolled and fitted up with other up-to-date appliances. He had always tried to bring under the notice of consumers the necessity for gas and air adjustment. People were getting to understand this. He was much in favour of maintenance, in regard to which he would go the whole hog, and have everything kept up to con- cert pitch. They must do this simply because they found that their opponents were spreading all sorts of nonsensical ideas, even among coal-gas consumers, and taking every advantage they could. But they could afford at all times to tell the truth. In showing people what they could do, they could always make very liberal discount, and yet have ample to spare to combat electric lighting. He was very pleased to see that show-rooms were being largely adopted by corporations. In many cases there had been a lot of fighting to get them. He did not think it was right that they should have their business restricted by a few who practised gas-fitting, because in many instances they found that these gas-fitters had developed into electric lighting engineers. They would find this, too, that in gas-engines, as compared with power engines, they had nothing to fear. They in Ireland might have, he was sorry to say, when they looked at the prices; but he had no difficulty whatever in fighting power-gas plants. They had at Stockton a power-gas plant put up in a large works, and the town gas removed; but after a week's working, the people asked them to put their 6-inch main back again. They were working with town gas to-day, and their own plant was standing idle. Their maximum price was 2s. 3d. per 1000 cubic feet, with a differential price of 4d. for prepayment meters. This differ- ence in price covered the installing of a light and pendant, and giving a griller free. When they could come down to 1s. 6d. or

2s., it gave them an exceedingly good chance of effectively combating electricity.

Mr. H. O'Connor (Edinburgh), regarding the 8000 cubic feet which Mr. Enright referred to as having been used for cooking purposes, asked if this had been ascertained by the use of a discount meter, or by separate meters, so as to get at the separate amounts. He was afraid that two-thirds was rather a high figure for cooking. He had elsewhere given his reasons for thinking that a higher price should be charged to prepayment meter users; and he need not now go into this question. But one great point was the higher cost of collection. The cost of gas into the holder, which Mr. Enright referred to as 1s. 3d., certainly seemed to him to be a very low one, in view of the charge of 5s. per 1000 cubic feet to consumers. Possibly the one price had been put too low, if the other was the average price in Ireland. With regard to the giving of good burners, there could be no question that they were necessary at all times. For a number of years the Glasgow Gas Department always had in the gas office a number of burners; and if complaints came in, they gave new ones to the consumers. Mr. Foulis told him that, in 99 cases out of 100, these people never came back to complain of the gas. Of course, this was in the days of the flat-flame burner. If they could manage to educate gas-fitters and plumbers a good deal more, they should have an immense help in extending the use of gas, both for lighting and heating purposes; and really the only reason why gas companies or gas managers required to take gas-fitting into their own hands was because the fitters and plumbers would not render themselves up-to-date in the matter of using gas for various purposes. He had been engaged, at different times, to give popular lectures to fitters and plumbers and to local consumers. He had tried to show them, by means of simple experiments and burners of different kinds, what could be done with gas, both for lighting and heating purposes; and it had been found that a little knowledge obtained in this way had been of considerable use in extending the applications of gas. There was no doubt that, if they could educate the gas-fitter, they would get a man who would then proceed to educate the gas consumer. And, after all, it was the gas consumer they wished to get at. The matter of fittings in houses was very important in Scotland, because a reduction of candle power was taking place, and the old gas-fittings, suitable for 25 or 30 candle gas, were no longer capable of carrying the gas that was required to pass through them for modern lighting. He thought that all Gas Associations should do what was done by the North British Association a few years ago—have a table of fittings prepared, and the fittings required for the various numbers of lights, and the number of feet required from the last fitting, so that the gas-fitter should have no excuse for putting in the wrong sizes of piping. A difficulty which gas managers had in coming forward and suggesting various fittings was illustrated to him some years back by Mr. Foulger, of London. He asked Mr. Foulger whether he had ever considered the question of making his own gas-meters, and he said: "For goodness sake don't suggest that. The gas-meter has always been considered the greatest liar in creation, and surely, if a gas company were to make meters themselves, the public would at once turn round and say they had made the meter to suit themselves—certainly not the consumer." So that antipathy to the gas-meter was not dead, or was not a few years ago. As regarded suction plant, he not long since delivered a lecture upon this subject in which he pointed out a number of the different points that were causing extra cost above the mere figures which were laid down by the makers of suction plants, which had to be taken into consideration when comparing coal-gas with suction-gas plants. He had had experience of these. He made experiments with gas-engines 25 or 26 years ago, in their early days, and had been keeping very close observation upon them since. There was one point that must be noted, which was that a suction-gas engine or gas plant, of 40 H.P. and upwards, required a man constantly in attendance if continuous working were required during the eight or nine hours in which men were at work; and in most cases where there was a stoppage for breakfast or dinner, the engines had to be kept running, so as to ensure that they would start immediately the men returned to work. All this had to be added to the cost of the suction-gas plant and suction power work as compared with coal-gas plant. The question of the status of the gas engineer was one which he had been very pleased to see for the last two years was being recognized by what might be considered the higher authorities in the engineering world. It was only within the past few years that a gas engineer had been elected to the Council of the Institution of Civil Engineers; and that was the late Sir George Livesey. Although there had been a gas engineer on the list of suggested councillors sent out to the members, it was only a few years ago that the general body of the members considered that those engaged in the gas industry were sufficiently learned in engineering matters to be allowed to be represented upon the Council of that body. He thought the reason for this was largely due to the fact that the gas engineer had been inclined to run too much upon the rule-of-thumb, rather than study the underlying principles which governed the various structures he had to deal with. He wondered how many so-called gas engineers were able to work out the stresses of a hundredth part of the structures that they put up in their works. He did not suppose many could do it. They worked by rule-of-thumb, or went upon what had been done before. If they took the trouble to work out these stresses, and to work out the various principles of the apparatus they put up, they should be able to make considerable economies. He was brought up in the school of economy, under Sir George Livesey, who never spent a penny where a half-penny would be sufficient, and who never painted a gasholder where he could tar it. As regarded attendance at these meetings, he thought a principle he had seen adopted by a number of gas managers in Scotland was an excellent one. They got members of their Committee or directorate to attend the various meetings, and learn for themselves the advantages and amount of information to be gained at them. In this way, in several instances, the gas manager had a portion, if not the whole, of his expenses paid for him.

Mr. Enright, in reply, said that the only point really upon which controversy had arisen had been the prices to be charged to slot-meter consumers. He found that when the additional price was being put on, it was lost sight of altogether that it was only for lighting purposes that this price was being fixed. If this were not the case, why should they give reductions of 2s. 6d., 1s. 8d., 1s. 1d., 1s., or 9d. to ordinary consumers for cooking, and still add $4\frac{1}{2}$d. or $5\frac{1}{2}$d. to cookers with a slot meter? He was not very strong on the point that they could not sell gas at the ordinary price; but he was more convinced now than ever, notwithstanding the argument put forward against the price with regard to the extra cost of capital, that they could sell gas at the ordinary price to the prepayment consumer, when they took into consideration that it was sold to a consumer for cooking purposes for less. Mr. Tyndall said that he (Mr. Enright) assumed that everything over 2s. 1d. ought to go to them. He said no such thing. What he said was that the days of "take it or leave it" were over, and that they could not go to a probable consumer, and, after convincing him of the merits of gas, ask him to pay a higher price than his next-door neighbour was paying for the one purpose. If these arguments were so true against the additional charge upon the prepayment meter consumer, why were they not equally as true against differential rates for gas-engines? Why sell gas for 1s. 6d. or 2s. to those who used gas-engines, when they charged a lighting consumer 3s. 3d.? To his mind, this was a distinction without a difference. The other point to be remembered was that the slot consumers they got were reducing the manufacturing cost, and that this would tend, in the end, to reduce the cost to ordinary consumers. He thanked Mr. Tyndall for his other kind references to the paper. Mr. Saville considered it better for an official not to be under the Local Government Board; but the matter cut both ways. He thought they ought to have some security, or some body—the Local Government Board or other—whom they could look to for protection against their employers when they were in the right. Mr. Young referred to the grievances of managers. For his own part, he could not suggest anything definite by which these might be got over. He introduced the subject into his communication to make the paper a controversial one, and to get the managers' interests expressed. He thought they might have got some other ideas as to how to put their status in a more sound position. He thanked Mr. Dunn for his very kind references to the paper all through. His contribution to the discussion was more interesting than the paper. Mr. O'Connor asked him how he got the 8000 cubic feet he assumed for cooking purposes. He used a discount meter. He found that some people were burning 14,000 or 16,000 cubic feet, and using 9000 cubic feet for cooking.

The "Soleil d'Or" Lamp.

According to the "Ironmonger" (Aug. 14), the Société Française Auer have placed a lamp on the market under the above name which shows some points of interest. Its power amounts to 1300 candles, which is given with a consumption of 1000 litres of gas per hour (28 cubic feet approximately). Only one mantle is used; and this is of quite moderate proportions—the great illuminating effect being attained by means of very rapid combustion of the mixture of gas and air. The temperature attained is much higher than usual. It is stated that the illuminating power is increased five-fold for the same surface of incandescent material. The lamp is connected with the ordinary gas-main; the gas being supplied at the usual pressure. But the thorough mixing with the air is the result of the latter being supplied under pressure. Instead of having a system of high-pressure air-pipes, a small electrically-driven fan is placed under the burner; the air taken from the surrounding atmosphere being forced towards the burner. The electrical energy necessary for driving the fan is furnished by means of a thermopile placed in the lamp-chimney. A few seconds after lighting the lamp current flows to the motor, which is enclosed, and has a direct drive to the fan.

Out of a total sum of rather more than £26,000,000 which the Prefect of the Seine has proposed to the Municipal Council to spend on improvements in Paris, £4,700,000 will be devoted to water and sanitary works.

The Junior Institution of Engineers are holding their summer meeting this week in the Midlands. It opened at Leamington on Saturday with a welcome by the Mayor, Mr. Alfred Holt, J.P. To-morrow morning will be occupied with a visit to the Mechanical, Electrical, and Civil Engineering Departments of the Birmingham University; and on Thursday afternoon the members will inspect the new gas-works of the Coventry Corporation at Foleshill.

SELBY NEW WATER-WORKS.

By Percy Griffith, M.Inst.C.E., and Bruce M'Gregor Gray, Assoc.M.Inst.C.E.

[Extracts from a Paper read before the Association of Water Engineers.]

The Previous Source of Supply.

The Selby Urban District Council and their predecessors have always been the water authority for Selby; the first works having been installed in 1854. At this time a borehole, 330 feet deep and 6½ inches diameter, was put down; the site being situated in the town, but no doubt at the time not so hedged round by buildings as it is at present. The quantity of water pumped at the date in question was 243,000 gallons per day. The rest-level was stated to have been 6 ft. 6 in. above Ordnance datum; and, after pumping, it was restored in a period of two hours. In 1885, another borehole was sunk to a depth of 390 feet, being 12½ inches diameter. By the year 1893, the yield of this was only 7700 gallons per hour (184,800 gallons per day); and in the year following the borehole was deepened to 674 feet, after which the supply amounted to 250,000 gallons per day. The records show that during the period of 25 years, from 1875 to 1900, the rest-level of the water fell about 12 feet, and the pumping level fell from 12·39 feet to 21·62 feet below Ordnance datum. From the year 1895 to the year 1900, when the question of new works was again under consideration, the pumping level had declined 10 feet, and the demand was becoming perilously close to the supply.

The New Scheme.

In May, 1903, Mr. Griffith reported to the Council on the main features of the new works which by that time were admitted to be necessary. In this report, he supported advice given by Professor Kendall, that the works should be out of the town, and that the best site would be adjacent to Brayton Barff. He recommended a boring of such a size that, if on testing it was found to yield a sufficient supply, it could be utilized for the permanent pumps. If this proved not to be the case, a 12 feet diameter well, 150 feet deep, with a boring beyond this depth, was recommended.

The population to be supplied being 8400, and the increase during the previous two years having been 614, or 7·88 per cent., Mr. Griffith calculated upon the population reaching 14,000 within a period of ten years; and assuming that the new works would also have to supply the villages in the immediate neighbourhood, he added a further population of 2000 on this account—making a total of 16,000. Taking a consumption of 18 gallons per head per day for domestic purposes on this total, and 7 gallons per head per day for trade purposes on the urban population of 14,000, the total demand likely to come upon the new works worked out at 386,000 gallons per day. Allowing for pumping during twelve hours out of the twenty-four, the standard capacity of the pumping plant was taken as 32,000 gallons per hour.

The following is a brief summary of the work carried out, with the leading dimensions of the principal items.

Borings.—Each 400 feet deep. First 100 feet lined with cast-iron tubes 24 inches internal diameter; a further 100 feet open boring 24 inches in diameter; the remainder 15 inches diameter.

Boilers.—Paxman's "Economic" or "dry-back" type, 9 ft. 6 in. long, 6 feet diameter, flue-tube 3 feet diameter, smoke-tubes 2¾ inches diameter; heating surface, 393 square feet; evaporative capacity, 1960 lbs. of water per hour; grate area, 14·5 square feet; working pressure, 150 lbs. per square inch.

Engines.—Triple-expansion marine type, indicating 70 I.H.P. at 20 revolutions per minute; cylinders, 13 inches, 20 inches, and 34 inches diameter; stroke, 24 inches. Corliss valves and gear. Fly-wheels, 10 feet diameter, weighing 5 tons each. Maximum steam consumption guaranteed under the contract, 12·9 lbs. per I.H.P. per hour.

Force-Pumps.—Triple ram pumps, worked direct from the engine cross-heads, 11½ inches diameter and 24 inches stroke. Valves of rubber, 4¾ inches diameter.

Borehole Pumps.—These are operated direct (without gearing) by means of disc cranks overhanging the outer bearings, and connecting-rods working the top centres of "inverted tee" levers. The pumps are worked from the outside centres of the levers; the inner ones being fitted to carry the balance-weights. The pumps are fixed so that the bottom of the suction-pipes is in each case 200 feet below the surface of the ground; the rising mains, barrels, and suctions being suspended from the head boxes, which are specially designed for the purpose. The pump barrels are 16 inches in diameter, with 3 ft. 3 in. stroke, of gun-metal throughout. The pump suctions are extended sleeves or boxes of gun-metal fitted with a rubber valve. The buckets are of gun-metal; and although the valves are of the usual design, the castings are extended above the packed or wearing portion of the buckets, so that the discharge of water always takes place above the barrels—that is, in the rising main, which is 2 inches larger in diameter. The pump-rods are wrought-iron tubes 11 inches diameter, provided with "clam" joints of novel design to avoid the usual screwed ends and sockets. An arrangement is provided by which, on the upstroke of the pumps, communication is established between the underside of the buckets and the interior of the pump rods or tubes. The rising main is formed of steel tubes 18 inches diameter, jointed in the usual way. Outside the rising mains are ⅜-inch brass tubes, with open ends, fixed at 200 feet below the surface, by means of which the depth of water in the borings is registered on a pressure-gauge worked from a Worthington steam-driven air-pump.

Buildings.—The engine-house is provided with two domes central to the borings, constructed of reinforced concrete sufficiently strong to bear the weight of the pumps during removal or refixing; special tackle being provided for lifting the plant. The other portions of the machinery are commanded by a travelling crane. The same building includes feed-pump and heater house, boiler-house, coal-store, and workshop. There is also a cottage provided for the foreman in charge of the works.

Accessories.—The pumping-station is fitted throughout with electric light supplied from a small generating plant fixed in the workshop, and accumulators stored in a special annexe. The electric light engine also drives the workshop tools—lathe, drilling-machine, forge-blast, grindstone, &c.

Reservoir.—This is situated on the Barff, at such a level that the head of water available at Selby Market Place is 160 feet. The importance of this somewhat excessive head is explained by the disastrous fire which occurred at Selby's most interesting abbey church in 1906, when, owing to insufficient pressure in the mains, and delay in getting fire-engines into operation, damage was done which has involved an expenditure of £45,000 to repair. In future it will be possible to throw a jet of water almost to the ridge of this lofty roof without the use of a fire-engine. The capacity of the reservoir is 800,000 gallons, representing about three days' supply at the present rate of demand. It is constructed with 12 inches of concrete for floor, brick walls 1 ft. 10½ in. thick at the top and 4 ft. 2½ in. thick at the base, and concrete roof in arches of 7 feet span (centres), 6 inches thick at the crown. The excavation revealed a very excellent foundation of good homogeneous clay; and the only point which may suggest discussion is the use of bitumen sheeting. It may be at once admitted that the advantages of this as compared with cement rendering—including, of course, the question of cost—are not so marked as to warrant its adoption in all cases; but the authors are satisfied their choice was justified by the results obtained. The reservoir has proved perfectly water-tight, notwithstanding the fact that water was not put into it until some twelve months after it was completed, and that the cost—viz., £4791—works out at £5 19s. 9½d. per 1000 gallons of capacity.

It will be interesting to record one difficulty which occurred during the interval that the reservoir was waiting for the delivery of water from the new pumping-station. During a very wet season, the floor was found to have arched-up to the extent of 5 inches between the rows of piers, and it was feared that some serious defect must have been present to account for the phenomenon. On removing a brick, and pricking a small hole in the bitumen sheeting, a discharge of air or gas occurred (with little or no water), and the floor gradually settled down to its proper position. The sheeting was, of course, easily made good; and the reservoir has proved "bottle-tight" ever since it has been in use. Perhaps this rather peculiar occurrence may be explained in the course of the discussion; but in any event, it seemed worthy of record. The reservoir has a valve-house adjacent to it; and in one section of this is fixed the recording apparatus of a Venturi meter, which itself is fixed on the outlet or supply main to Selby.

Points of Special Interest.

Although it is hoped that what has already been written will not be devoid of interest, the authors propose to deal with some special points in connection with which they have gained experience such as may prove valuable to other members.

(1) *Testing Boreholes.*—In connection with the first borehole, the contract provided for a three weeks' continuous test by means of a steam-driven pump; and a large engine and pump (of the "concertina" type) were installed for the purpose. Many difficulties were met with in operating this plant. Several important parts had to be renewed, and much time was lost before a satisfactory test was obtained—and this notwithstanding the fact that there was no scarcity of water within a distance of 100 feet below the surface. On the completion of the second boring, the authors decided to test this by means of an air-lift plant; and this was dealt with as a separate contract, whereas the first test was included in the contract for driving the borehole. It was, however, possible to estimate the amount provided for the test in the tender for the first borehole, and thus to obtain a comparison of the cost of the two systems. Both tests, being under similar conditions except as regards length, the comparison will, therefore, be of value. The cost of a 21 days' continuous test with steam plant worked out at about £600, and a 14-days' test with air-lift plant at £300. Thus in every respect the latter system proved itself far superior; and the authors suggest that in all cases where sufficient immersion can be obtained below the normal pumping level, and also perhaps within some limits as regards the capacity of the plant, this method of testing boreholes may be accepted as preferable to any other.

(2) *Design of Borehole Pump.*—From the brief description already given, it will be seen that the pump is single-acting, and, therefore, requires to be balanced, not only as regards the dead-weight of the rods and bucket, but also as regards the work done on the up-and-down strokes respectively. The balancing of the rods is, of course, accomplished by counterweights suspended from the inner extremities of the "tee-bobs;" but the equalization of the work between the up-and-down strokes was accomplished by the less common method of carrying tubular rods (having an external displacement area equal to one-half that of the pump-buckets) down to the tops of the buckets. It may perhaps be worthy of discussion as to whether this method is superior to the more usual alternative of increasing proportionately the amount of the balance-weight.

Having provided borings of a considerable depth, in which the rest-level of the water was within 45 feet of the surface, it was decided to fix the pumps at such a depth that the available supply of water should not at any future time be exhausted. The test pumping had shown that the normal level of the water when being pumped at the required rate—viz., 32,000 gallons per hour—would not be more than 125 feet below the surface; but there appeared to be no practical objection to fixing the pumps to draw from a depth of 200 feet, which gave an immersion to the suction-valves of about 80 feet below the normal pumping level of the water.

(3) *Main Laying.*—One or two points of special interest may be mentioned in this connection. (*a*) The authors used flanged pipes for the rising main up the steep side of the Barff; and their experience proved that this was not an advantage, as the rigidity of the joints involved considerable difficulty in regard to the depth of the trench, and a good deal of cutting to make the final connections at each end of the pipe-line. (*b*) In the case of the delivery main, the joints were ordinary socket joints, but made with lead only. The only difficulty met with here was the necessity for pouring the lead in at a suitable temperature to prevent it melting the solid lead fillet, and running through into the pipe. (*c*) In some of the smaller branch connections, lead wool was used, and proved highly successful. (*d*) The whole of the new mains were tested to a pressure of 120 lbs. per square inch, laid and proved perfectly tight.

Working Costs.

The authors regret that, at the time of preparing this paper, they are not able to give detailed results as regards the working costs of pumping with the plant as described. It is intended, however, to make a proper test; and if the results are available in time, they will be added either as an appendix to the paper or in the form of "correspondence" in the Transactions. The average total cost appears, however, to be about 0·78d. per 1000 gallons pumped a vertical height of 210 feet.

Cost of the Works.

The following statement will be self-explanatory, and, the authors hope, useful to the members.

	£	s.	d.
1. Cost of the Act	£3,986	10	0
2. Land, wayleaves, and special drain to lead water to canal during test pumping	1,968	17	6
3. Two borings and test pumping	2,751	13	11
4. Pumping machinery in duplicate, with electric light plant and all accessories	8,017	0	0
5. Building work at pumping station with cottage. road-making, fencing, and planting site with trees, &c.	4,684	5	5
6. Service reservoir, valve-house, Venturi meter, water-level recorder, and accessories	4,791	11	0
7. 12-inch rising main to reservoir and 10-inch delivery main to Selby	4,128	2	6
8. Telephone from town hall to pumping-station	119	13	2
9. Engineer's fees, expenses, and sundry special items not yet finally adjusted (say)	2,552	6	6
Total	£33,000	0	0

The expenditure authorized by the Act was £30,000, in addition to the cost of the Act; so that the Council still have about £1000 in reserve for future capital outlay on the works.

At the close of the paper, Mr. Griffith said he should like, with the President's consent, to invite discussion on a point not mentioned in the paper itself. This was upon the use of notched weirs for measuring the delivery of pumps. At Selby, he had arranged a rectangular notched weir, the discharge over which was registered by means of a float carrying a graduated vertical rod. The scale on this rod was plotted in accordance with the generally accepted formula, and when compared with measurements taken of the amount actually discharged into the reservoir, it was seen that there was some discrepancy; and in order to secure accurate readings, it had been found necessary to fix the cross wire, which was purposely made adjustable, so that when the water was level with the sill of the weir the wire was not exactly opposite the zero on the scale. He would, however, be glad if members would suggest some reason for this discrepancy, as he had found a similar inaccuracy occur in the case of a V notch used in the same way.

Discussion.

The President expressed the hope that there would be a free discussion of the paper, in which, he said, so many points had been raised. It was more particularly interesting to engineers who had pumping schemes to attend to.

Mr. H. Ashton Hill (South Staffordshire Water Company) said the paper read by Mr. Griffith was a very useful one. The first note he had made was on the large bore. He wondered why, in 1885, they did not make a larger borehole than a 12½-inch. If they had done so, it might have been unnecessary to have called in Mr. Griffith. The next question he had noted was the lining of the borehole 100 feet down. Mr. Griffith told them that the site of the pumping-station was an ideal one, and that there was no chance of pollution. Now, probably a large portion of this 100 feet would contribute a considerable amount of water; and he should like to know what determined Mr. Griffith to line the borehole to so great a depth as 100 feet, thus excluding the water. With regard to the borehole pumps, he should like to ask if any difficulty had been experienced in the working of the engines from the overhanging of the disc-cranks on the outer bearings, and whether the engines had worked smoothly. With respect to the bitumen sheeting in the reservoir, if this were in the new red sandstone he did not know where the gas could come from; and he should be inclined to say it was air, forced up by water, under pressure from higher ground. The question as to the different methods of testing the yield was the next point he had noted. There was not very much difference. He reckoned that the great advantage was in the convenience of the air-lift. They were in some cases able to pump more water, and to put down a larger plant at much less cost.

Mr. A. Towler (Leeds) said it seemed rather singular that the makers of the plant were only asked to give for it a guarantee per indicated horse power. He should have thought that an experienced engineer would have asked for a guarantee which would have included the efficiency of the engines and pumps.

Mr. William Matthews (London) said that at the end of the paper Mr. Griffith had—very properly, he considered—admitted that the working costs, so far as he had been able

ascertain, were very high indeed. Going still farther ck (he himself was working backwards in his argument), Mr. Towler had pointed out, they had only the duty of the gines considered as indicated horse power. He thought e reason for the total cost being so high was probably e, not to the fact that the engine itself might not be a rfectly economical one, but to the type of pump adopted, it was next to impossible, with its design, to get anything e a reasonable percentage of efficiency from it. This as proved by some of the difficulties which Mr. Griffith ggested had arisen. If they turned to the details of the rehole pump and the pump suction, it was not difficult to e where the low efficiency of this particular pump came ; and he was convinced that Mr. Griffith would find in ne that the pump efficiency was exceedingly low in this se. They were told that at the outset difficulties arose ith the pump-valves. This was exactly what he would ve anticipated would happen. These valves were put on the side of the inner portion; so that they were not opping valves, but were opening and closing at right igles to the exhaust of the pump. With regard to the servoir, it was very costly relative to other reservoirs which d been constructed; and he was rather inclined to think is was due to a depth of only 10 ft. 6 in. of water having en adopted. This was not at all an economical depth for a vered service reservoir. To get the best results, a depth of or 16 feet was required. Neither did he like the idea of tumen sheeting, unless the authors were obliged to put it in. t the best it was a perishable material; and it could not ssibly last so long as the rest of the work. The authors oke of using a notched weir for the purposes of temporary ugings. He thought there was a difficulty in using such eirs, because it was next to impossible to get temporary ugings arranged so that they could obtain a proper estimate the velocity of approach.

Mr. Easton Devonshire (London) desired to refer to e cost of the reservoir described by the authors. As he d pointed out on similar occasions during the past few ears, the cost of construction of reinforced concrete reser-oirs of which he had experience compared very favourably ith that of solid concrete or masonry reservoirs which it as still the practice to build in England, where practical nowledge of reinforced concrete construction was not ad-anced. The covered reservoir built for his Company at ntwerp a few years ago corresponded in depth with the elby reservoir; but its cost per million gallons was one-alf that given by the authors, though it was fair to add that s capacity was about 50 per cent. greater. With regard to e estimated working cost of the engines and pumps given the paper, the figures he had jotted down from memory s to the cost of pumping at the two stations of the South Iants Water-Works certainly bore out Mr. Matthews' con-ention as to the high cost of working of borehole pumps as ompared with well pumps for moderate lifts.

Mr. Charles Hawksley (London) said he did not know whether the reduction of 12 feet in the rest-level of the water was intended to be 12 feet in addition to the 9 feet reviously mentioned by the authors, or whether it meant 2 feet in all. The estimated consumption of 18 gallons of water per head per diem for domestic purposes, for which rovision had been made, was, in his opinion, very ample; nd he should think that, in a town like Selby, with good management and the waste well looked after, it would be ound to amount to less than 18 gallons—probably 14 gallons t most—per head per day. The steam consumption was tated to be guaranteed at 12·9 lbs. per indicated horse power. He did not know whether this had been proved o be the consumption on trial; but supposing it to be the guaranteed consumption, the trial showed that the anticipa-tions formed had been realized. If a trial had been made, perhaps Mr. Griffith would tell them what had been the outcome. With regard to the notch gauge, was it not possible that the apparent difference between the results as measured at the reservoir and those ascertained by calculation was due to the recording apparatus, if such an apparatus was used? With it, there was always a certain amount of friction; and unless the float was of considerable diameter, there was always a difference between its immersion when it was going upwards and when it was going downwards. This, of course, would make a difference. With regard to the uplift of the bottom of the reservoir, it was stated in the paper that the foundations were of good homogeneous clay, and it would appear to him that it was most probable that water found its way, perhaps in small quantities, between the bottom of the reservoir and the clay forming the foundation. In that case there would be an uplift, due to the head from which the water was derived; and though it was stated that little water was found, and that it was mostly air which escaped, that air was probably under the pressure of the water, and therefore the uplift was due to the same cause—namely, the water under the floor. If this were the explanation, it would be likely to recur whenever the reservoir became empty or nearly so, and there happened to be a similar pressure of water under the floor. Therefore he should think it would be advisable to make provision for the release of the water.

Mr. H. E. Stilgoe (Birmingham), referring to the compensation to be given to owners of wells depleted by the new works, said that perhaps Mr. Griffith would tell the members whether the clauses in the Selby Act bearing upon this matter were put in by arrangement, or whether they were forced upon the promoters.

Mr. F. W. Hodson (Loughborough) said the clauses giving owners of wells within 2½ miles compensation, either in money or in water, or by improving the supply at the depleted well, were forced upon Selby by the opponents of the scheme. He should like to ask Mr. Griffith to be good enough to give them some information as to what had been the effect of these clauses on the undertaking. Another point was with respect to a free supply of water from the mains as compensation to a depleted well. The free supply involved some injustice to the authority, because it gave so much more than was taken away. Not only was the quality better, but the quantity used was vastly increased, and all cost of drawing water and the maintenance of wells and pumps ceased; and there was no doubt that the mere fact of putting in the public water supply was a material advantage to the owner of a shallow well.

Mr. E. Sandeman (Bamford) said, with regard to the reservoir, he agreed with Mr. Hawksley's ideas. He had had two cases, and there was another within his knowledge, where water had penetrated beneath asphalt, and raised it perhaps 5 or 6 inches from its concrete bed. Probably in the case of Selby it was also caused by water acting in the way Mr. Hawksley had described. A very interesting point came out with regard to the air-pipe in the borehole. He believed Mr. Griffith used compressed air for raising water out of the borehole, and he should like to know what were the best proportions of the pipe under water compared with the pipe out of water.

Mr. Charles Hawksley, speaking of the provisions for dealing with depleted wells, pointed out that it was required that the owners of the public supply should make good any deficiency which was actually proved to exist in the supply within a certain distance of the well. It might be of interest to the Association to know that, in the form in which it stood, the clause provided that public water suppliers should make good the deficiency in such a way that the cost to the owner of the private well for obtaining water should not be greater than it had been previously. There was also power given to the water authority to have access to the well of any person who might thereafter intend to allege that his well had been depleted, or that his private supply had been lessened; and this power enabled the water authority to make observations from year to year of the height of water in any such private wells, and therefore to prepare themselves for eventualities, and to show probably that the loss of water had been due to natural causes, and not to pumping at the well of the water authority.

Mr. H. Ashton Hill said he should like, with permission, to make a few further remarks. He did not think the paper should pass without reference by him to a point which had been raised by some of the speakers, as to the probable reason of the costly character of the pumping machinery being due to the fact that the pumps were in boreholes and not in wells. He thought that in his paper of last year he indicated certain reasons why it might be preferable in one case to put down a borehole, and in another to sink a well. He thought that people who had had more experience of either a borehole or a well were very much inclined to say that either the one or the other was best, according as they had found it. He heard one say, after having had experience with a borehole: "No more wells for me." This was a mistake, because he knew instances in which wells had been sunk and headings driven where they could not put down boreholes to obtain the same yield. Before the meeting concluded, he intended to bring before the members a case of his own, in which they had an installation that was

pumping water from two boreholes in fairly good quantities. They raised 2 million gallons per day; and he was going to submit that he was pumping water from these boreholes more cheaply than anything that was shown in the figures given in this paper or in the one on suction gas, &c.* He was not going to say this was because the pumps were in boreholes; but it did go to show that they must not condemn borehole plant which, as he had mentioned, was pumping 2 million gallons a day, and doing it so efficiently and with such economy. No difficulty whatever was being experienced with regard to borehole pumps. He had had them working for many years without the slightest hitch or trouble whatever. He thought it only right that the other side of the question should be put, so that members might not be misled.

Mr. C. Clemesha Smith (Wakefield) followed with some remarks on the question of the supply of water to districts outside the parliamentary area by large water authorities, and gave the results of his ten or twelve years' experience of the difficulties of such supply.

Mr. J. Shaw (Boston), a former member of the Association, obtained permission to ask whether one reason for the small economy of the plant was not the fact that the buckets of the borehole pumps were too far underneath the water. With regard to "boreholes *versus* wells," as a general rule, in the new red sandstone, if he had the designing of any work, he should put down a borehole, because in that formation the water level generally decreased in two or three years; and if they went on lowering their pumps, following the water down, it was much more easily done in a borehole than if they had to sink a well farther. The authors might have told them of the difficult nature of the ground where the reservoir was placed. So far as could be seen, the site was on a hill, and all the material had to be dragged 150 or 160 feet up it. He had no doubt that a line of railway would have had to be constructed, in order to get the materials up to the place; and it would be much more expensive to convey the materials up to the reservoir than to build it in a flat country, or where the site was easily accessible. In regard to the air or gas that was underneath the reservoir, the bottom would be at least 150 or 160 feet above the normal water level in the new red sandstone, so that the air could not have come out from this particular point. He should suggest that as the footings of the walls would be a little lower than the main body of the reservoir, there was a hollow in which air had accumulated below the floor, and that when rain fell on the covering of the reservoir the water ran down the outside of the walls, and drove the air underneath the floor, and thus caused the pressure.

Mr. Percy Griffith, in replying to the discussion, said Mr. Ashton Hill had asked why the boring was not made larger in diameter; but, with the results obtained, he (Mr. Griffith) felt confident any such increase would have been an unnecessary extravagance. With regard to the working costs per 1000 gallons of water pumped, the figure given in the paper was a very approximate one, and did not represent the results of normal working. It included, for example, the wages of two men whose time was not nearly fully occupied (an item which represented half the total cost of pumping); and, further, it was obtained at a time when the pumps were working very inefficiently. Certain alterations were now being carried out in some points of detail, and a further test would be made when these were completed. The results would be communicated to the members in due course, and he felt confident they would compare favourably with those obtained by them in other cases. A test had been made to prove the duty of the engines alone, and the full duty guaranteed by the makers had been realized; so that when the pumps were working efficiently there was every prospect of a very satisfactory result being secured. In regard to the general working of the borehole pumps, he had to confess that at the present moment one pump was working much more steadily than the other, and that some difficulty had been met with in connection with the overhanging disc referred to in the discussion. All the difficulties that had been met with were, however, being overcome; and he saw no reason to regret any part of the design he had adopted. He was, however, quite prepared for members to suggest that it could be improved upon, as one generally felt that one could improve upon the work carried out by someone else. He wished particularly to thank Mr. Ashton Hill for his second speech, dealing with the relative value of boreholes as compared with wells. He (Mr. Griffith) was not at all prepared to accept the opinion that the extra cost of a well would have been covered by the greater economy of well pumps compared with borehole pumps.

Mr. Matthews remarked that he had referred to cases where pumps were fixed within a depth of 200 feet from the surface; and he agreed that at greater depths the same argument would not necessarily apply.

Mr. Griffith accepted this reservation, but added that he could not accept the opinion even limited to pumps within a total depth of 200 feet. He wished to express his appreciation of the presence and interest of Mr. Charles Hawksley, and regretted that, in Mr. Gray's absence, he could not answer his first question as to the fall of the water level in the boring at the old works. With respect to the domestic consumption provided for, the figure of 18 gallons per head per day was the known consumption at the time the new works were designed, and was no doubt due to the existence of some old mains laid more than fifty years ago. Any economy which might be made in this direction (by the prevention of waste) would, of course, be to the advantage of the new plant in reducing the hours of pumping, and in lengthening the period during which the works would maintain the supply. He could quite accept Mr. Hawksley's suggestion that the discrepancy in the readings of the weir gauge was due to friction in the working of the float and rod, though every precaution had been taken to avoid the difficulty. In this connection, he was grateful to Mr. Matthews for his suggestion as to the use of submerged circular orifices in place of notched weirs. He had considered this point, but had found some difficulty in applying the principle in this particular case. In regard to the lifting of the reservoir floor, he would explain that the bitumen sheeting, with its brick-on-edge covering, was laid on a solid bed of concrete 12 inches thick. This concrete was particularly well laid, and was, he believed, impervious to air or water, so that air could not have got underneath the sheeting except through the base of the brick walls; so he accepted Mr. Shaw's suggestion that this had been probably caused by saturation of the surface soil, which imprisoned the air, and ultimately acquired sufficient pressure to force it between the concrete and the bitumen sheeting. On the very important question raised as to the depletion of adjacent wells, he was pleased to say that, so far, there had been no case of it at Selby, which proved that the water passed freely through the sandstone; and the effect of pumping was limited to a very restricted area. In this connection, he wished to refer to the conditions which would have prevailed if they had sunk a well instead of a boring. In the case of two other works similarly situated to those at Selby, this had been done, with the result that in the course of a few years the pumping level of the water had been lowered to such an extent that the supply could not be maintained except by driving extensive headings and additional boreholes, which was work involving far greater expenditure than the simple alternative of lowering the pumps—a course which could be adopted in a borehole and not in a well. The driving of headings also involved the depletion of the water over a much larger area; and had this course been adopted at Selby, there would no doubt have been very heavy claims from owners of neighbouring wells. With respect to the design of the pumps, he welcomed the criticisms that had been offered, though he could not accept the suggestion that the design adopted was essentially faulty; but he particularly wished to remove the impression that the pumps were in any sense a failure. The amount of slip was now quite within the limits of ordinary practice; and, in the one case, the working was very steady and uniform. Under such circumstances, he did not think that any fault could be found with the arrangement of the suction-valves. With "Dermatine" valves and stronger springs, these valves were always working in a perfectly satisfactory manner. In the case of a test plant, it was not necessary to go very closely into theoretical calculations as to the diameter and depth of the air and water tubes respectively, at any rate so long as the plant accomplished the end in view—viz., gave the required quantity of water during the test. Where such plants were used for permanent pumping, he agreed that the calculations should be made with the utmost care, in order to secure reasonably economical results. Speaking generally, he thought that the air-pipes required to be immersed below the pumping level of the water to a depth approximately equal to the height the water was lifted; but he believed the evidence on this point was very incomplete, and unreliable.

* See "Journal" for June 15, p. 727.

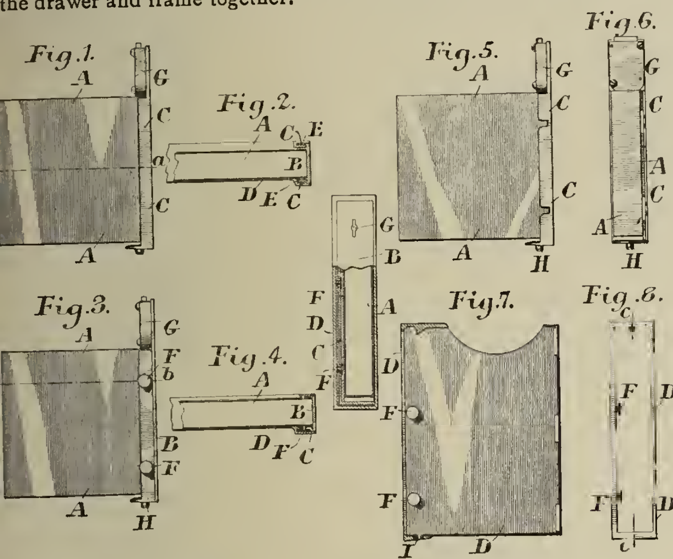
REGISTER OF PATENTS.

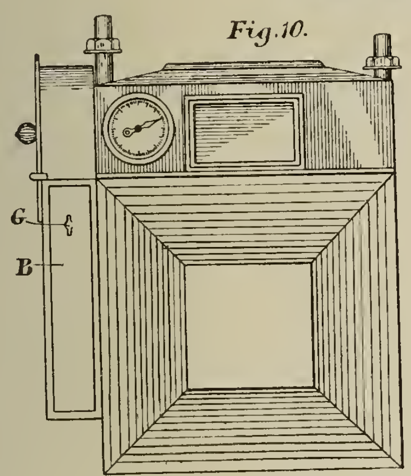
Protecting the Drawers of Coin-Meters.

Glover, T., of Norwich.

No. 3768; Feb. 19, 1908.

The patentee proposes to construct money receptacles, or drawers and frames for same, of coin-freed and other apparatus with slotted lips on the frame and headed studs on the drawer (or headed studs on the frame and slotted lips on the drawer), so that when the drawer is in position in the frame, the slotted lips engage the headed studs and hold the drawer and frame together.





Glover's Coin-Meter Box Protector.

As shown in fig. 1 (a side elevation of the drawer) and fig. 2 (section on line *a*), the front of the drawer A, or a frame B connected thereto, is formed with backwardly projecting lip C, or lips on both sides; and on the sides of the frame D or apparatus enclosing and next to the drawer there is also formed a lip E, or lips on both sides, extending in the opposite direction. Or, as in fig. 3 (side elevation of drawer) and fig. 4 (section on line *b*), headed studs F on the drawer A, and slotted lips C on the frame D, or, as in fig. 5 (side elevation of frame), fig. 6 (end elevation), fig. 7 (longitudinal section on line *c* of fig. 8, which is a front view of the frame D), and fig. 9 (which is a part sectional front elevation of both drawer and frame), it may be headed studs F on the frame D, and slotted lips C on the drawer A—but always in such a manner that, when the drawer is pushed home, the lip or lips (slotted or not) or the headed studs F engage the headed studs or the lip or lips of the walls of the casing enclosing the drawer, and so connect the walls of the casing and the drawer firmly together, and prevent a chisel or like instrument forcing the side walls of the casing away from the drawer. Fig. 10 is a side elevation of a meter with the drawer and its frame in position, and secured to the side of the meter.

The front wall of the drawer carries the lock G, and the patentee prefers to form the bottom of the wall with a stud H, which, when the drawer is being placed in position, is situate in a hole I (fig. 7), and when the drawer is pushed fully home or in the vertical position, and the bolt of the lock projected, the drawer will be held firmly in the casing top and bottom, as well as at the sides.

Gas-Stoves.

Maynard, G., of East Ham, and Veness, G. T., of Wanstead, Essex.

No. 12,345; Dec. 7, 1908.

This invention has for its object "the provision of means whereby the heat from the gas is conserved and transmitted to the article to be heated in a more economical and efficient manner than has obtained in the past;" and it consists in arranging the burners in relation to the hot-plate or other device supporting the receptacle to be heated in such a way that the relative distance between the burner and receptacle is varied automatically in conjunction with the supply of gas, so that when the gas is "full on" the burner occupies its lowest position, and when the minimum of gas is being burned it occupies its highest position relative to the hot-plate. This arranging of burners in relation to the hot-plate may, however, be varied at the will of the user, irrespective of the quantity of gas passing through the gas-supply cock.

Gas-Generators.

Jabs, A., of Zurich, Switzerland.

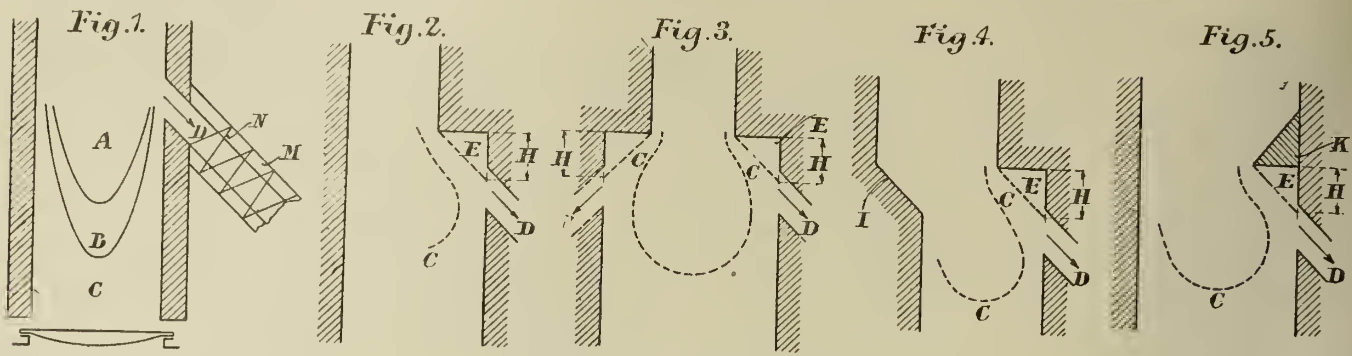
No. 12,446; June 9, 1908.

This invention (the patentee points out) is based upon the fact that in a generator are three zones. In the first or upper zone the freshly-charged fuel is heated and dried. In the second or central zone it is further heated and distilled; a distillation of tar, lighting gas, &c., occurring simultaneously, and terminating practically when, in the case of coal, the temperature rises to about 700° to 800° C., and thus converts the coal into coke. The coke sinks into the lowest or third zone in which it burns—that is to say, is oxidized with the admission of the oxygen of the air to carbon dioxide; and if the temperature is sufficiently high, it is reduced to carbon monoxide. The generator or coke gases produced during this heat-generating process leave the lowest zone at approximately 800° C.; develop, by giving off heat in the central zone, the products of distillation of the fuel; and, by intermingling with same, form a mixture of gases, the temperature of which, when leaving the upper zone, is about 500° C., but when the fuel contains a great deal of moisture considerably lower. The heat, which, when the outlet temperature of the mixture of gases is 500° C. amounts to about 10 per cent. of the energy of the coals, is mostly wasted if the gas is conveyed further for heating purposes or cooled for explosion engines, and the high average temperature of $(800 + 500) \div 2 = 650°$ C. in the upper zones of the generator is not favourable to the formation of valuable bye-products, as they become decomposed into inferior products. Thus, for instance, the tar is further dissociated at a higher temperature and decomposed into less valuable compounds rich in hydrogen and hydrocarbons; and the ammonia is decomposed at higher temperatures into nitrogen and hydrogen. In the distillation of peat, the methyl alcohol dissociates at temperatures exceeding 300° to 400° C. The usual method of working generators is, therefore, unsuitable for giving a higher output in bye-products. For the purposes of heating, another objectionable feature is the high percentage of nitrogen, amounting to 50 to 55 per cent. of the mixture of gases, as the nitrogen reduces the temperature of combustion in proportion to its heat absorption.

This invention obviates (it is said) the disadvantage of having the gases leaving the producer at a high temperature inherent to the method of working just described, on the basis of the discovery that the high temperature of the mixture of gases is chiefly due to the fact that the decomposition heat absorbed in the central distillation zone is much smaller than that developed by the combustion of coke in the lowest zone. If, however, only a portion (preferably half) of the coke is burned, and the other portion is laterally withdrawn from the generator at a point near the upper limit of the lowest zone—this being preferably effected at about one metre above the grate, where a temperature of about 700° to 800° C. exists—only half of the quantity of hot gases formed during the combustion of the coke will pass into the distillation zone, because a combustion layer of incandescent coke of 60 to 70 cm. is sufficient for reducing the carbon dioxide to carbon monoxide. As, however, the whole quantity of coals is distilled here to coke—that is to say, the same amount of heat is absorbed as hitherto—the quantity of hot gases above referred to, and now reduced to one-half the previous amount, must still give off in the distillation zone the same amount of heat that was given off there previously by twice the amount of hot gases. The temperature of the coke gases in the mixture of gases will be consequently reduced not only as before to $800° \text{ to } 300° = 500°$ C., but twice as much—that is to say, to $800° - 2 \times 300° = 200°$ C. One kilo. of coal gives 0·3 cubic metre of lighting gas, the heating power of which is 4600 units per cubic metre, and 3·9 cubic metres of generator gas of a heating power of 1100 units. Therefore a mixture of gas of $\frac{0{\cdot}3 \times 4600 + 3{\cdot}9 \times 1100}{4{\cdot}2} = 1350$ is the heating value in heat units per cubic metre. As about half the produced coke is discharged laterally, and only the other half burnt up and transformed into gases, the mixture of gases will therefore contain not 13 cubic metres of coke gas to 1 cubic metre of lighting gas, but perhaps only 7 cubic metres of coke gas. The heating value in this case, instead of only 1350 units as before, would then amount to $\frac{7 \times 1100 + 1 \times 4600}{8} = 1540$ heat units. The bye-products of the distillation (tar oils, ammonia, &c.) will, moreover, be in a much more valuable state when contained in only 8 cubic metres of gas of a temperature of only 200° C.; so that their extraction will be correspondingly more profitable.

Through this working at a lower average temperature than usual, the tar will contain a much larger proportion of ingredients with low boiling point than that obtained by the ordinary process suitable for the high temperature of 500° C. The portions of the tar having a high boiling point will be condensed in the upper and less hot portion of the distillation zone, and will impregnate the partly-distilled coal, or the coke formed thereby, that is situated in this portion of the zone. If the coke thus impregnated sinks down into hotter parts of the distillation zone together with the charge, a fractional distillation and decomposition of the tar contained in the coke will take place. CH_4 and H_2 are evolved, and the remaining carbon or all the hydrocarbons having a high boiling point fill up the pores of the coke and combine with it, so that a solid, hard coke is produced. The heat required for distilling the fuels is not generally known. The applicant has calculated the distillation heat for 1 kilo. of Saar district coals at about 300 heat units; for peat substances, the heat was found to be at the outside 120 heat units. When applied to peat, the method described would, therefore, give comparatively more coke as a bye-product than when applied to ordinary coals.

It has been found that the lateral discharge of a portion of the charge in generators having shafts of equal cross-section in all zones does not



Distillation Zones in Gas-Generators.

give a satisfactory result, because, instead of completely distilled fuel —*i.e.*, fuel from which no more gas can be extracted at the temperature existing in the distillation zone, about 700° to 800° C.—only a mixture of fresh fuel, partly distilled fuel, and completely distilled fuel, could be discharged. The object desired is not therefore attained. No method hitherto used has, it is said, given a satisfactory result, as the behaviour of the descending charge and the progress of distillation in any given cross-section were not properly understood. Therefore, the circumstances were not taken into account. Owing to the friction between the descending charge and the walls of the shaft, the fuel is loosened, and, consequently, the rising hot generator gases, which, by giving off heat direct to the fuel, bring about distillation, encounter resistance on the walls which becomes smaller in proportion as they rise between them. The coking progresses, therefore, at the circumference to a much greater extent; and the distribution of fuel in a shaft generator is, consequently, such (as shown in fig. 1) that in the zone C is coke, in the zone B dried fuel which is being distilled, and in the zone A moist fuel which is being dried. If, however, the coke is withdrawn through an inclined tube D, not only coke from the zone C, but also dried fuel from the zone B and moist fuel from the zone A, will escape, as the zone C has only a small depth as measured inwardly from the wall of the generator towards the centre. It is therefore necessary to make such arrangements that only completely distilled fuel should be able to pass into the outlet pipe D.

The shaft generator constructions shown in partial section in figs. 2, 3, 4, and 5 fulfil the above condition. The essential point is that above the outlet pipe D there is produced, by means of a projecting arch or by an enlargement of the cross section of the upper portion of the shaft, a natural slope of the fuel, so that the zone C assumes at the sides the shape shown dotted.

As the thickness of the layer at the discharge or outlet pipe is smaller than in the centre of the combustion chamber, and as, owing to the enlargement of the cross section of the generator, the lower mass in the slope is loosened, the mass at the surface of the slope will be distilled very quickly; so that only completely distilled fuel will pass into the discharge pipe D. The applicant utilizes for this purpose the great deviations of the limiting surfaces of the zone from the horizontal plane shown in the vertical sections in figs. 1 to 5, and the reduction of the depth of layer corresponding to the increase of the limiting surfaces —namely, by widening the cross section of the generator in the coking zone (as in figs. 2 and 3) in such shape that the coke descending from the upper portion of the generator forms a slope which produces in the cross section of the coke discharge pipe D an increase or thickening of the lowest zone C in which the coke is burnt, and at the same time forms a free surface from which the gases will escape into the chamber or space E, having the height H, from which they are discharged in a suitable manner, and therefore, as intended, completely distilled fuel is discharged from the generator through the outlet pipe D.

Though of different construction, the devices I in fig. 4, and K in fig. 5, act in a similar manner; the devices forming a chamber E above the mouth of the coke outlet pipe D, and the chamber keeping free for the descending coke a slope, for the free escape of gases into the chamber E, and enabling only completely distilled fuel to be withdrawn from the generator through the pipe D as intended. For the purpose of cooling the coke laterally discharged from the generator (through the pipe D figs. 1 to 5), a casing or jacket M is used (fig. 1), preferably with a helical baffle N, through which cooling liquid or cooling air is passed; the heat absorbed by the helical tubes being utilized for feeding boilers, or heating the air for supplying the generator.

Inclined Purifier Grids.

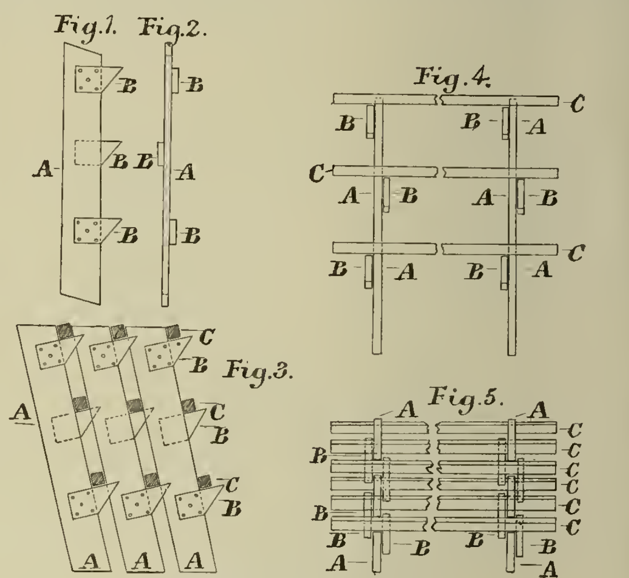
Watson, C., of York.

No. 17,296; Aug. 18, 1908.

The illustration shows a form of these improvements, and the way in which the grids are fitted together in the purifier-boxes.

The apparatus involved consists in reality of two distinct parts only —the carrier or bearer or support and a crossbar. The shape of the carrier is an elongated rhomboid of any thickness; the ends being at such an angle with the sides that, when standing on one end upon a flat or level surface, such as the ordinary bottom flat grid of a purifier, the carrier leans at an angle. On one edge of the carrier are a number of projections (to form supports for the crossbars and to engage with the carrier next in front) attached to the body of the carrier in such a position that an angle or hollow is formed on the upper side of the projection into which the crossbars fit and rest upon the projections, supported by the carriers.

In placing the carriers in a purifier-box, they are spaced such a distance apart that the crossbars, when laid on the projections, sustain the weight of oxide laid upon them. The number of projections and the corresponding crossbars required, depends upon the depth of material to be used. After placing the two or more carriers in position, two or more crossbars are laid upon the projections, and the next set of carriers placed in front and the crossbars put upon them, and so on to the end as required. The bars, when placed in position, form oblique rows; each centre bar breaking joint with the bars above and below it. When the grids are fitted in, the box can be filled by throwing or tipping material from the top; and the box can be emptied in a similar way from any side or from the centre.



Watson's Inclined Purifier Grids.

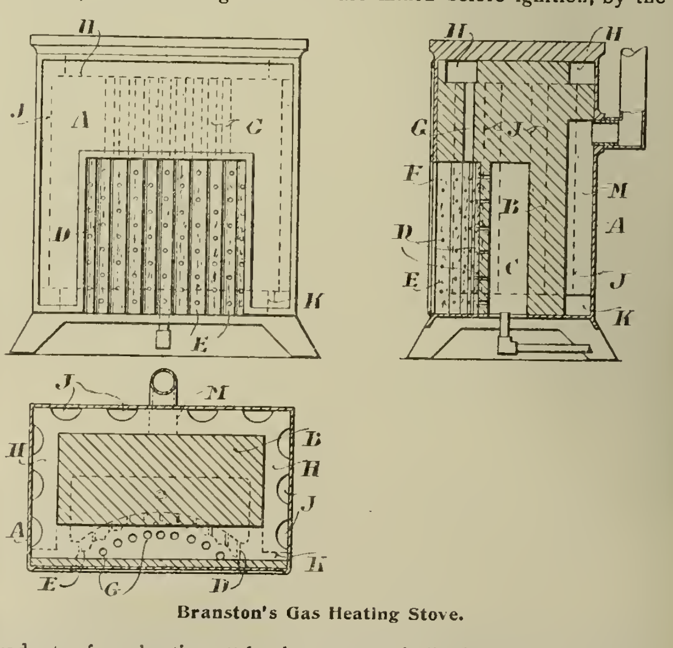
Fig. 1 is a side view, and fig. 2 a back edge view of a single support or carrier. Fig. 3 is the end elevation of a series of carriers A placed in front of each other with the locking projections, in the form of cleats B, nailed on alternate sides, and showing sectionally the crossbars C in their positions at the angles made by the projections with the edges of the carriers. It also shows how the crossbars form oblique rows, and how they break-joint in their vertical planes. Fig. 4 is the front side elevation, and shows the relative positions of the carriers and the crossbars. Fig. 5 is a plan showing how this arrangement of carriers and bars forms tiers of grids.

Gas Heating Stoves.

Branston, F. R. E., of Chipstead, Surrey.

No. 15,621; July 23, 1908.

This invention has for its object to provide means for heating the chamber, in which the gas and air are mixed before ignition, by the



Branston's Gas Heating Stove.

products of combustion, "for the purpose of effecting a more complete mixture of the gas and air, more complete combustion, and greater

efficiency and economy in use, together with important hygienic advantages."

In the metal casing A is a fire-clay block B, having a cavity C. D are horizontal perforations, leading therefrom and passing into vertical grooves E in the front of the block (which is recessed). On the face of the block is disposed asbestos or other incandescent material. G are perforations leading into a chamber H (between the block and the top of the casing) extending to the side and back of the stove; and J are flues leading to the chamber K at the bottom of the stove. M is a flue leading from the chamber K to the flue-pipe.

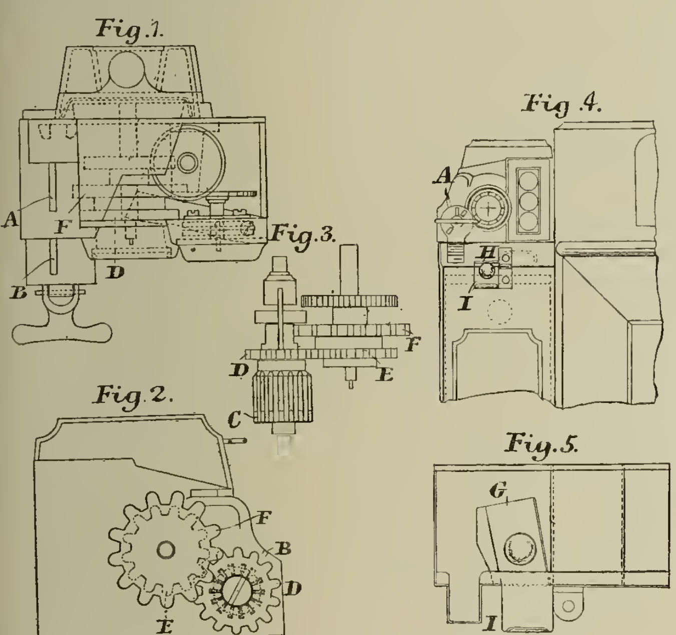
In operation, air and gas in proper proportions for combustion are admitted into the chamber C, where they are heated and allowed to expand "so that a thorough mixture of gas and air at one temperature and one pressure is obtained." The mixture passes through the horizontal holes D, and burns as it issues therefrom. The flames are guided within the grooves and heat the asbestos facing; the products of combustion passing up through the tubes G into the chamber H, down through the flues J into the lower chamber K, and up through the flue M to the flue pipe.

Coin-Freed Gas-Meters.

Wilson, G., of 's-Gravenhage, Holland.

No. 109; Jan. 2, 1909.

This invention relates to coin-freed gas-meters in which a device is provided whereby the mechanism which controls the supply of gas is actuated to different degrees according to the value of the coin inserted, whether to actuate directly a toothed wheel or other transmission device, or to connect with its carrier another device (normally loose on the carrier) capable of actuating the toothed wheel, which, in turn, actuates the usual mechanism.



Wilson's Two-Value Coin-Meter.

Fig. 1 is a top plan view of the casing containing the device. Fig. 2 shows a side elevation of the interior mechanism. Fig. 3 is a top plan view of same. Fig. 4 is a front elevation showing the invention applied to a gas-meter. Fig. 5 is a horizontal section of fig. 4, showing the shoot for the return of misplaced coins.

The casing which contains the mechanism has two slots. A slot serves to insert penny pieces or the like; while B slot serves to insert (say) sixpenny pieces. Journalled below the slots, and within the casing, is a spindle, the outer end of which is provided with an operating handle. Two longitudinal slots extend diametrically through the spindle, with inclined walls to prevent the pieces of money dropping through. Loosely arranged on the part of the spindle in which one of the slots is provided, is a drum C provided with radially extending slots and made with a toothed pinion D, meshing with a toothed wheel E made one with or attached to another toothed wheel F.

The various parts are arranged so that the drum C is below the slot B of the casing, while one slot of the spindle is below the slot A. If, now, a penny is inserted into the slot and the handle is rotated through a complete or half-revolution, the money retained in the slot and projecting from the spindle meshes with, and rotates, the toothed wheel F one tooth (the drum C being moved the same distance), whereupon the penny drops into a suitable receptacle (fig. 4).

If a sixpenny piece is inserted into the slot B, it will engage one of the slots of the drum C; and as soon as the handle is rotated, the spindle will bring the second slot so that the piece of money drops into it. As, now, the piece is partly engaged in one slot and partly in the other, the latter will be temporarily connected and rotate with the spindle. The toothed pinion D will, therefore, rotate the toothed wheel and cause the wheel F to be rotated through six teeth.

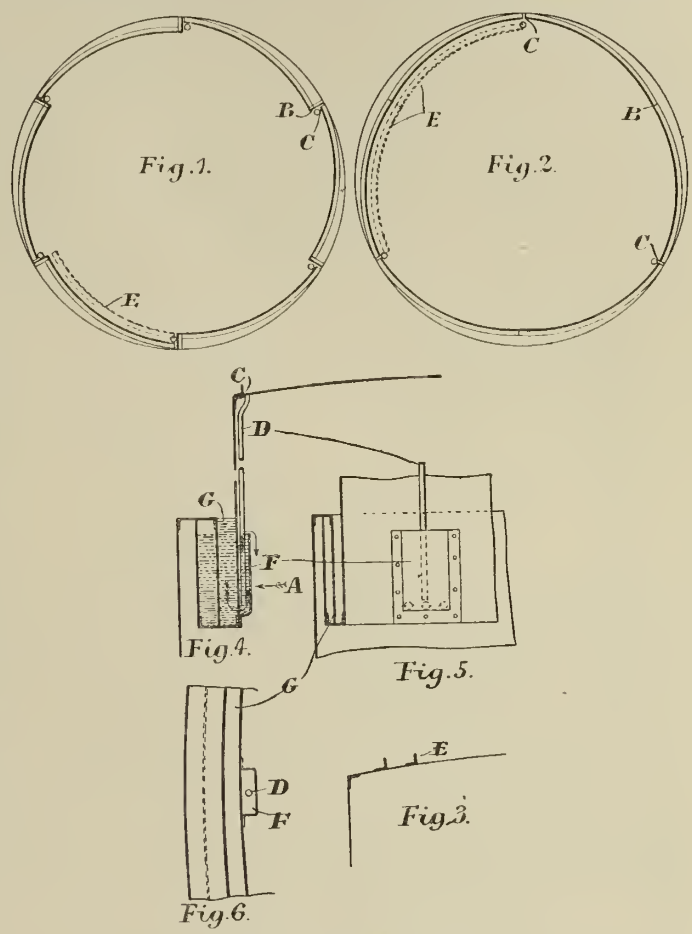
Arranged below the spindle is an incline or shoot G, having an obliquely arranged rim extending from below the slot of the spindle to an opening provided in the front side of the meter, and below which is attached a small table I. Should, now, a sixpence be inserted by mistake into the slot A (through which penny pieces must be introduced), the sixpenny piece would freely drop through the slot of the spindle and be caught by the rim. The latter brings the piece upon the shoot G, which guides it to the opening and upon the table I; thus preventing it dropping into the cash-box without operating the mechanism.

Gasholders.

Henry Balfour and Co., Barker, J., and Hunter, J., of Leven, N.B.

No. 3580; Feb. 13, 1909.

This invention aims at so confining and directing the water or moisture which may fall or be condensed on the crown of a gasholder that it will be continuously made to flow to certain points at or near the circumference and conducted to the tank, either by external or internal conductors, and "thus always tend to keep the crown seams clear of accumulated water."



Balfour's Gasholder Gutters.

Figs. 1 and 2 are views looking on the crown of a holder showing the disposition of the gutters or ridges in two forms. Fig. 3 is a part section of a holder showing portion of the crown and the side with one or two gutters. Fig. 4 is a part section showing the top lift and the one in connection with it. Fig. 5 is a view looking in the direction of the arrow A (fig. 4). Fig. 6 is a part plan of fig. 4.

A series of gutters or ridges are arranged round the circumference of the holder. The extremity B is at a higher level than that at C, because the crown is dome-shaped, and, consequently, any water which may come against the ridges will at once flow to the lowest level, even should the holder be tilted. The water thus directed may be delivered externally and flow on to the upper surfaces of the spiral guides attached to the sides of the holder, or it may flow into internal conducting pipes D passing down the inside. In fig. 2, the ridges or gutters are arranged to have two highest points B adjacent to each other, and similarly with regard to the lowest or delivery points. The dotted lines E represent supplementary gutters; their object being to ensure that no water may overflow the lowest one should there be an unusual fall of rain. Each internal conducting pipe D terminates in an internal pocket or weir F, in communication with the outside cup G by means of holes. By immersing the outlets of the pipes D in water, their outlets are sealed so far as the escape of gas is concerned, and the surplus water from the crown or the weir will fall into the tank.

Three-Way Valve for Fluids.

Peebles and Co., of Edinburgh, and Waddell, A., of Dunfermline.

No. 4201; Feb. 20, 1909.

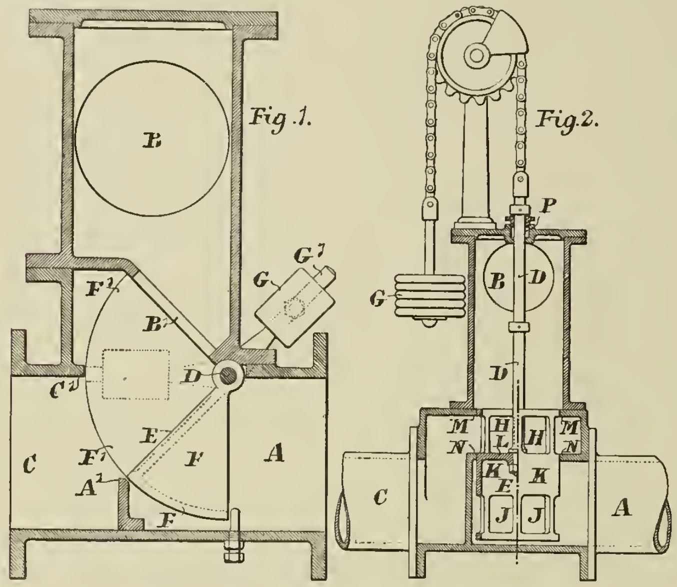
Apparatus according to this invention comprises a casing having one outlet and two inlet ports, and within the casing a valve controlling the two inlet ports, or ports communicating with them, and operated to close one inlet port by the preponderance of effective pressure (not necessarily the greater actual pressure) at the other port. Means are provided for ensuring that the valve shall not rest in an intermediate position; while in some cases there may be a permanent bye-pass between the high-pressure inlet and the outlet.

The illustrations show an example of the apparatus in which a hinged valve is used, and a like view where a piston valve is employed—"both examples being applicable to the control of combustible gas or other fluid."

In fig. 1, there are provided in a casing two inlet ports A B and an outlet C. Between them is pivoted on a horizontal spindle D a segmental valve E, alternatively controlling what are in effect three seats—one inlet seat A^1, upon which the valve is resting, a second inlet seat

B^1, above the valve, and an intermediate seat C^1. There is formed upon the rear of the valve a segmental face with side curtains F, the side walls of which may extend into lateral recesses F^1 in the walls of the valve casing. The curtain is of such size that, upon the valve rising until it meets the intermediate seat C^1, communication between both inlets A B and outlet C are cut off. The least further rise opens the outlet C to the lower inlet A; the curtain part F continuing, however, to cut off the inlet B until the valve is against the upper seat B^1, when communication is fully open between the lower inlet A and the outlet C. Thus the upper inlet B is entirely cut off before the lower inlet is in communication with the outlet C; and, reversely, on the valve descending to the position shown, the lower inlet A is entirely cut off before communication is established between the upper inlet B and the outlet C. It is thus impossible, if there be greater pressure at one inlet than at the other—as may well be the case—for the fluid at higher pressure to pass to the inlet where the pressure is lower.

In the case of low pressures, the weight of the valve E itself prevents it rising and opening the inlet A until the pressure at the lower inlet A is considerably in excess of that at the outlet C or inlet B; while it will fall as soon as the pressure at the inlet B, *plus* the weight of the valve, outbalances the pressure at the inlet A. The valve may, however, be balanced, or even set, so that the pressure at the inlet B must be higher than that at the inlet A before the inlet B is opened, by means of an adjustable weight G on a lever G^1 keyed to the valve spindle D.



Peebles and Waddell's Three-Way Valve.

Since the lever G^1 and its weight G are horizontal when the valve E is in position intermediate to the two inlets A B, and since, when in this position, the weight G is acting at its greatest effective arm, pressure in either inlet, which will cause the valve either to rise or fall to that position, will cause it to move fully up or fully down, as after the critical position the effective arm of the weight becomes less. Or the weight G may be in a position as indicated by the dotted lines; so that when the valve is in the intermediate position and the pressures at the inlet A and the inlet B are the same, the weight G will overbalance the pressure from the inlet A and cause the valve to close the passage from the inlet A—thus opening the passage from the inlet B to the outlet C. Thus it is practically impossible for the valve to remain in the intermediate position with both inlets A B closed.

In fig. 2, the piston valve E has in it two series of manifold ports H J, and between them an unpierced portion K and a diaphragm L. It co-acts with two valve seats M N in the casing—the lower for the inlet A, the upper for the inlet B. The valve is carried upon a spindle D passing out through a stuffing-box P; and there is attached to it a chain passing over a sprocket wheel and carrying a weight G, which may either counterbalance the valve E (in which case preponderance of pressure in either inlet over a mean will open that inlet), only partially counterbalance it (in which case preponderance over a given greater pressure at the lower inlet will open that inlet) or more than counterbalance it, in which case preponderance over a given greater pressure is required at the upper inlet to open that inlet.

The action of the valve is as that of the first example described. There is provided upon the sprocket wheel, a tumbler weight, whose functions in preventing the valve resting at mid-position in either direction are identical with that of the weight G in this first example—that is to say, the tumbler weight reaches a position directly over its fulcrum when the valve reaches mid-position. Therefore its effective arm is zero, and any pressure which would raise or lower the valve to this position will move it the full distance. Or the tumbler weight may be in such a position that, when the passage is open from the inlet A to the outlet C, its effective weight is minimized or altogether done away with, by being immediately over the fulcrum; so that when the valve is in the intermediate position and the pressure from the inlet A and B are the same, the weight G will overbalance the pressure from the inlet A and cause the valve to close the passage from it, thus opening the passage from the inlet B to the outlet C.

Rhyl Gas Undertaking.—It was stated at the last meeting of the Rhyl District Council that the gas-works belonging to the town were valued on their earning capacity at £110,000. The price paid for them by the town sixteen years ago was £34,000; and about £12,000 has since been expended on them. They yield a profit of nearly £2000 per annum to the ratepayers.

PARLIAMENTARY INTELLIGENCE.

COATBRIDGE GAS PROVISIONAL ORDER.

House of Commons Committee.—Tuesday, Aug. 10.

(*Before Mr.* ARTHUR STANLEY, *Chairman, Mr.* G. D. FABER, *Mr.* G. HAY MORGAN, *and Mr.* G. HARDY.)

The Gas and Water Orders Confirmation Bill, containing the Coatbridge Gas Order, which is opposed by the Corporation of Coatbridge, came before a Select Committee constituted as above. It was passed by the House of Lords on the 15th ult. (see *ante*, p. 193).

Mr. HONORATUS LLOYD, K.C., and Mr. JOSEPH SHAW appeared for the Company; the petitioners being represented by Mr. LEWIS COWARD, K.C., and Mr. R. J. N. NEVILLE.

Mr. HONORATUS LLOYD, in opening the case, said that in comparatively recent years it had been the practice of Parliament, in consequence of the introduction of the incandescent burner, to reduce the illuminating power of gas; and the object of the Order was to bring the Company into line with the modern practice with regard to testing. At present their gas was tested by the union-jet burner; but it was inaccurate and absolutely obsolete, and they were asking to substitute for it the No. 2 "Metropolitan" argand burner. The other point was that, instead of supplying gas of 20-candle power, they asked that for the future it should be of 15-candle power. Before the Board of Trade, the Company were opposed by the Local Authority, who desired to have certain concessions made to them; and their wishes were granted. But when the Bill came before the House of Lords, they again opposed, and further concessions were made. The result was that, as the Order now stood, it contained more points in favour of the Local Authority than were actually sought. The Company's original powers were obtained by their Act of 1877, when they were incorporated as a maximum price Company; but subsequently a sliding-scale was introduced, with a standard price and a standard dividend. The result was that the consumers got between five and six times as much advantage as the shareholders. In fixing the standard price at 2s. 6d. per 1000 cubic feet, Parliament also gave the Company a neutral zone, so that the sliding-scale should not operate against the Company so long as the price remained between 2s. 6d. and 2s. 11d. The Local Authority held, however, that if the Company were permitted to supply gas of 15-candle instead of 20-candle power, and tested it by a test more favourable to themselves, some concession ought to be made to them; and they suggested a considerable reduction in the standard price. This was the rock upon which the whole of the financial arrangements of the Company were founded; and if it were interfered with these would be upset, and the Company would have to divide a reduced dividend, notwithstanding the fact that they had admittedly carried on their business excellently and economically. The Board of Tade decided not to reduce the standard price; but they took away the neutral zone, which was a most serious loss. The Local Authority next asked that a testing-station should be provided at the Municipal Buildings; and, after discussion in the other House, it was so decided. Then they alleged that the pressure provided by the ordinary Act was not sufficient; and a higher one had been inserted in the Order. Clause 10 was also in the Local Authority's favour, providing as it did that, at the request of any consumer other than one by a prepayment meter, the undertakers should supply and fix, free of charge, a sufficient number of burners in substitution for those in use at the commencement of the Order. The capital of the Company was divided into two classes; the original capital having a standard dividend of 10 per cent., and the more modern capital one of 7 per cent. These dividends had varied from £10 to £11 7s. 6d. per cent., and from £7 to £7 19s. 3d. per cent.. But although that was so, the actual average return to the investors was only 4·58 per cent. The Company did not see their way to going on selling gas at the low price at which they were now able to supply it, unless they obtained some assistance. Cannel coal now stood at a prohibitive price; and gas of 20-candle power could not be obtained from ordinary coal. So that the Company had to resort to other means of obtaining gas of this illuminating power. They had availed themselves of benzol, which had the effect of enriching the gas temporarily; but if the powers which they now sought were granted, they would have to use benzol no longer, because they could get gas of 14 or 15 candle power from the coal already obtainable, and would save 2½d. per 1000 cubic feet in manufacture. The Local Authority contended, however, that the saving would be considerably more than 2½d., and that the standard price should therefore be reduced from 2s. 6d. to 2s. 2d. If this were done, the Company would be absolutely destroyed. It was also suggested by the petitioners that 15-candle power gas was unsuitable for Coatbridge, because they required portable lights for their engineering works. But what the promoters were seeking to do was what had been done all over the country in places where there were much larger works than those in Coatbridge. The Local Authority had also asked for a calorific power test; and, at the first blush, he agreed that it might seem a taking suggestion. But there was only one instance in which it had been set up—namely, in the Gaslight and Coke Company's Bill of this session. This, however, was the result of years of experiments with the coal that was used; and it was possible to tell the Committee what the standard should be. There was nothing of the sort here; and if the calorific test was to be applied, it should be by a Public Act or by an amendment of the Gas-Works Clauses Act. As to the carrying forward of certain moneys—another point mentioned in the petition—it had been raised in the House of Lords, and the promoters had undertaken to rectify the matter if necessary. If a certain amount was to be taken from the reserve fund and put to the profit and loss account, it would be done.

Mr. COWARD: I wish to have it distinctly stated in the Order; and I do not see why it should not be so. It is the usual thing.

Mr. HONORATUS LLOYD: It is not the usual thing. If we have done anything wrong, we shall have to put it right, and will do so.

Mr. *James Johnston*, the Chairman of the Coatbridge Gas Company,

ien gave evidence in support of Counsel's opening statement. He iid the Company was incorporated with a capital of £44,650, made up f £12,650 of original stock, and £32,000 in new shares. For the last ten ears, the average dividends had been £10 12s. 6d. on the 10 per cent. ock, and £7 8s. 9d. on the 7 per cent. shares. As to the question hich had been raised with regard to the reserve fund, he said the Company's accounts had been audited in the ordinary way for several ears, and no question had been raised by the Corporation until they ame to the House of Lords. If, however, there had been inadverence, the Company were prepared to put it right.

Wednesday, Aug. 11.

On the resumption of the proceedings this morning,

Mr. *Johnston* continued his evidence, and was cross-examined by Mr. Lewis Coward, who drew attention to the statement of the witness hat the Company had had to resort to their floating balances to make ip their dividends in the last few years. Counsel said it was admitted hat the Company had paid sums in excess of dividends, and witness ad been authorized by the Directors to state that the matter would be ut right. It was common ground that there had been a mistake; and he Local Authority held that these sums should be put back.

Mr. Honoratus Lloyd: Whatever has been done by inadvertence vill be put right.

Mr. Coward: Then I shall ask the Committee to put it right in the Order.

In further cross-examination, witness agreed that the reduction in lluminating power would be really from 20 to 13 candles; whereas in he Order it was stated to be 15 candles, and would be equivalent to a saving in cost of 2½d. per 1000 cubic feet.

Mr. Coward: And we, on the other hand, say that the reduction will be from 20 to 10 candles, and that the saving will be 4d. per 1000 cubic feet.

Witness did not agree that, as a result of the saving in the manufacture of gas, there would be a sum of £1700 a year going into their pockets, or that the consumer would get no benefit.

Mr. Coward pointed out that the Company placed the saving at £1700; whereas the Local Authority contended it would be £2720.

Witness objected to the Company being saddled with the calorific power test, because they were only a small concern, and nobody could tell yet what the figure should be. He understood that the only instance in which the test had been applied was the Gaslight and Coke Company's Bill, where it was a matter of agreement. He acknowledged, however, that, as 75 per cent. of the Company's supply of gas was for heating, the calorific test would be an important thing.

Re-examined by Mr. Honoratus Lloyd, witness said that though the Company were advised that the saving would be 2½d. per 1000 cubic feet, they feared that the maintenance of their works in the future was going to cost more; and their anxiety was to supply gas at a low price. It was in order to save any increase in the actual selling price that they wanted to save the 2½d. The saving to be effected by residuals was very much less. They were getting about half as much for tar as they were doing in 1903. There was no prospect of any saving being made with regard to coal.

Mr. *Thomas Wilson*, the Engineer and Manager of the Company, said that since 1898, when the neutral zone of 2s. 6d. and 2s. 11d. was fixed, the average price had been 2s. 4½d. per 1000 cubic feet. He described the question of the application of a calorific standard in the Company's case as "a farce." The candle test was quite sufficient.

A discussion took place between Counsel with reference to the calling of Mr. Henry O'Connor as a witness for the promoters. It was stated by Mr. Coward that the promoters had agreed that Mr. M'Cosh's evidence in the other House should be taken as then given. On the other hand, Mr. Shaw pointed out that Mr. O'Connor was away, and that they doubted whether they would be able to call him before the Committee. They understood that the same courtesy as had been extended to the petitioners in the case of Mr. M'Cosh was extended to them in the case of Mr. O'Connor.

The Chairman decided that it would be better not to call Mr. O'Connor, but that his evidence as given before the other House might be referred to if necessary.

Mr. *Corbet Woodall* was then called. Explaining the effect of the neutral zone, he said the Company might raise the price of gas from 2s. 6d. to 2s. 11d. without suffering in the matter; but when the price exceeded 2s. 11d. the dividends would be reduced. The effect of the sliding-scale was to make the consumers partners with the shareholders. In the case of the Coatbridge Company, if the price of gas went below 2s. 6d., there was an increase of 5s. per cent. on the 10 per cent. stock, and 3s. 6d. per cent. on the 7 per cent. stock. On the actual price now charged under 2s., there was an increase of six times 5s. on the 10 per cent. stock, and of six times 3s. 6d. on the 7 per cent. stock. The advantage to the shareholders from the sliding-scale was summed up in 1d. per 1000 cubic feet, which represented 6d. to the consumers. It was extremely creditable that the standard price in the present case should be so low as 2s., which was one of the most striking testimonies to the value of the sliding-scale system. The concern had been very well managed; and the consumers were bound to benefit therefrom. The union-jet burner was not a satisfactory one for testing 15-candle gas. With regard to the calorific power test, it was simply silly to suggest that a test of this kind should be put on a Company such as the one at Coatbridge until the matter had been more fully investigated and understood. He agreed with the Chairman of the Company that if they were to have the test at all, it should be in relation to the whole of the gas industry. At Coatbridge there had been no tests for calorific value, and no one was in a position to put in a figure as to what the calorific standard should be. Even if the whole of the gas supplied were used for heating purposes, there were no figures upon which they could fix a standard.

This closed the case for the promoters.

Mr. *E. H. Stevenson* then gave evidence in support of the petition. He agreed that the Company's works were well constructed, and he considered that the concern was well managed. But he submitted that if the illuminating standard were lowered, as was suggested, the consumers would receive gas of less than half the light-giving power than that to which they had been accustomed. He had always advocated that the consumer should get the whole of the saving effected; otherwise it was equivalent to the Company coming to Parliament and asking for an increase in the standard price. In circumstances such as these, it was entirely contrary to the practice of Parliament not to make a reduction in the standard price. The calorific power test must be commenced at some time or other; and he saw no reason why it should not be begun in the present case. They knew very well what the approximate calorific value of the gas would be; and the test which would apply to London 14-candle gas was a very generous one to apply to 15-candle gas, and need not hurt the Company in any way whatever. With regard to the accounts, there were certain sums which had been placed to the reserve which ought to have been carried to profit and loss. There was no reason why this should not be definitely stated in the Order, and then there would be no question of taking it to the Courts.

In reply to the Chairman, witness agreed that the illuminating power of the gas should be lowered; the only point was that there should be a reduction in the standard price.

Mr. *Andrew Lamberton*, a member of the Town Council, denied that there was any foundation for the suggestion that the Council intended to purchase the gas undertaking.

This closed the evidence; and no speeches by Counsel were made on either side.

The Committee decided that it should be provided in the Order that the sums which had been wrongfully added to the reserve fund should be transferred to the balance of profit and loss carried forward; that the dividends which had been paid in excess of those authorized should be deducted from net profits applicable for the payment of dividends; and that the amount paid to the insurance fund in excess of that authorized should be remedied. Subject to these conditions, the Order was allowed to proceed.

PROTECTION OF WATER SUPPLIES.

Proposed Legislation.

Lord Desborough lately introduced into the House of Lords a Bill to determine the rights and liabilities of persons supplying water under the authority of Parliament in certain cases. Its objects, as specified in a memorandum attached to the Bill, are: (1) To provide that no water undertakers shall sink wells or construct works for obtaining their supply unless such wells and works and the sites thereof have been expressly approved by Parliament. (2) To amend the law in regard to underground water, by providing that wherever private supplies are injured by the abstraction of water for public supply, by means of future works, the owner shall be entitled to compensation. (3) To provide that where, by means of future works, water is taken from any district for supply to communities outside that district, the district whence the water is taken, and through which it is conveyed, shall be entitled to demand a share of such water for its own needs, upon terms to be agreed or fixed by the Local Government Board.

In the House of Lords on the 5th inst., Lord Desborough, in moving the second reading of the Bill, said it had been introduced at the instance of the Central Chamber of Agriculture, on account of the harm that was frequently done to country districts by the unprotected state of their water supplies. The Earl of Liverpool said the Local Government Board did not fail to recognize the importance of the questions dealt with in the Bill; and the President had had them under consideration for a considerable time in connection with future legislation dealing with the protection of water rights and water supplies. In the opinion of the President, however, the Bill was too general in its proposals; and the Board did not favour its second reading. The Earl of Onslow (the Lord Chairman of Committees) said there was really no proposal in the Bill which had not already received the sanction of Parliament. It was important to discourage the idea that local authorities might sink wells wherever they chose, without coming to Parliament for the necessary sanction. Lord Newton urged that it was desirable that the Chairmen of Committees should have definite rules by which they might be guided. As it was not of much use proceeding with the Bill if the Government were unfriendly to it, he suggested that the Local Government Board should appoint a Departmental Committee to consider the special points that had been raised. A decision might be arrived at before next session, when a Model Clause serving as a future guide to Private Bill Committees might be submitted. The Earl of Crewe did not deny the importance of the question raised by the Bill, nor the existence of a grievance, and he thought there ought to be some inquiry; but what form it should take was a matter in regard to which there was considerable doubt. As to whether it should be a Committee of that House, a Joint Committee of the two Houses, a Departmental Committee, or an inquiry in some other form, the House would hardly expect him to give an opinion without consulting with his right honourable friend the President of the Local Government Board. So far as the Bill was concerned, it was obvious that it could not become law this session; and whether it was wise, in the circumstances, to proceed with it, he left to their lordships to decide. The Marquis of Salisbury thought that their lordships should agree to the second reading of the Bill; leaving for subsequent consideration the question of sending it to a Committee. The Bill was then read a second time.

The Export Duty on Coal.—In the House of Commons last Thursday, Mr. Fell asked the Chancellor of the Exchequer what would have been the revenue which would have been received from the export duty on coal if it had not been taken off during each of the past three years, and supposing such export had not been affected by the duty. Mr. Hobhouse replied that, under the conditions specified, the revenue that would have been derived during the years 1906 to 1908 inclusive was estimated at £2,500,000 for 1906, £3,150,000 for 1907, and £3,100,000 for 1908.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held last Wednesday, at De Keyser's Royal Hotel, Victoria Embankment—Mr. CHARLES CARPENTER (the Chairman) presiding.

The SECRETARY (Mr. F. M'Leod) read the notice convening the meeting, and also the minutes of the last ordinary meeting. The seal of the Company having been affixed to the register of proprietors, the report (which has already appeared in the "JOURNAL") was taken as read.

The CHAIRMAN: I have now the pleasure to move the adoption of the report and the accounts appended thereto for the past half year. The salient features of the Company's working during that period have been set out with the usual detail in the statement. We think that not only those who are able to attend these meetings—and I am glad to see so many present this afternoon—but those, too, whose affairs prevent them doing so, are entitled to the fullest possible information as to the Company's business; and we endeavour to give effect to this view in framing our bi-annual report. At the same time there are many details which cannot conveniently be brought under notice in this manner; and I desire to supply as far as possible these omissions in asking your acceptance of the report and accounts.

THE DIVIDEND.

We propose to pay the full sliding-scale dividend at the rate of £5 6s. 8d. per cent. per annum. As you are all aware, our dividend is a State-regulated one; the basis being the price at which we sell our gas. Of all our productions, gas is the only one which we have the sole right of supplying in our particular district. Anyone may manufacture tar products, anyone may manufacture ammonia products, or make and sell coke, all of which articles are important factors in the economic conduct of our business; but we alone are entitled to distribute gas, whether for lighting, heating, or power. In return for this privilege, Parliament fixed a basis price for it—namely, 3s. 1d. per 1000 cubic feet. This price was determined upon after full and patient hearing by Committees of both Houses of Parliament, before whom all the local and other authorities in our area of supply were represented; and its granting by the Legislature is, in effect, a "Charter" on the faith of which you have invested the money which enables the businesss to be carried on. With this basis price of 3s. 1d., you are entitled to a dividend of 4 per cent. per annum; but for every penny per 1000 cubic feet that we can sell gas at a lower figure than the standard, you are entitled to an extra 2s. 8d. per cent. Gas was sold last half year at 10d. below the basis price; and ten times 2s. 8d. equals £1 6s. 8d., which, added to £4 (the basis dividend), makes the figure of £5 6s. 8d. which appears in the report. It may not be out of place for me to remind you that, in order to entitle us to pay a dividend at this rate, gas has to be sold to the consumer cheaper to the extent of £505,380 per annum than at the standard price fixed by Parliament. As the report states, the charge for gas was reduced at Midsummer by 1d. per 1000 feet; and the dividend therefore payable for the current half year will be at the rate of £5 9s. 4d. per cent., instead of £5 6s. 8d. (Hear, hear.) So much for the dividend. I think I am justified in first devoting these few words to its consideration, because we have given a good service to our consumers; we have been, I think I may say, model employers to our workpeople; and it is now right and proper that the shareholders should receive their meed of attention likewise.

THE CONSUMPTION OF GAS.

The consumption of gas has remained to all intents and purposes unaltered. If the last six months are compared with the corresponding ones, there is a fractional decrease—namely, 0·26 per cent. But last year was leap year; and if the same number of days are compared by striking out the figures for February 29, 1908, there is a similar fractional increase—namely, 0·39 per cent. This result must be regarded as satisfactory. There is no doubt that the increase in price to which we were driven by the last advance in the cost of coal is responsible, as well as bad trade, for reduced consumption. The increased amount the gas consumer had to pay in South London as between gas at 2s. and gas at 2s. 3d. was over £154,000 per annum; and trade was too bad to enable so large a sum to be raised without some attempt at retrenchment. The slot-meter provides an admirable instrument for such a purpose; and as, out of 341,000, more than 235,000 are of this pattern, it will be realized what a large number of consumers are able to exercise this close control upon their use of gas.

THE COAL QUESTION.

The report goes on to tell you that though coal has been bought at a lower price, yet the saving has more than disappeared, owing to the reduction in the returns from coke and breeze. One would think that the purchase of coal, not only at a fair price but in regular deliveries to the capital of a country possessing large coalfields and abundance of labour, would not be the anxious matter it is. In the North of England (from which our supplies mainly come), the miners showed no anxiety to have an Eight-Hours Act. You have only to visit the North Country mining districts to see why—they are perfectly healthy and happy under the existing arrangements. Yet Parliament has placed them under the Act which Lord Joicey—possibly the greatest living authority on the subject—has said must have the certain effect of increasing the cost of obtaining coal. It would be impossible to minimize the concern to which the present unsettled state of affairs has given rise. A dispute recently happened between the Scotch coal masters and the miners, which should, and could, have been settled between them by mutual concessions. Instead of this, however, the officials of the Miners' Federation of Great Britain invited a ballot as to whether or not a general strike should take place over the whole of the United Kingdom, regardless of the loss and suffering this would entail to the entire community. The saddest part of the story is that an overwhelming majority—viz., 455,381 (518,361 against 62,980)—voted for a strike which would have paralyzed all industry and taken from many thousands their means of livelihood. We know, and you know, what co-partnership has done for us, yet when an endeavour was made to apply the self-same principle to one of the Durham collieries, the attempt failed because the men did not see their way to follow their employment without having what we may call the strike weapon up their sleeve. Well, our course in the matter is a perfectly clear one. We owe a duty to the State in making known upon every possible occasion the incalculable good co-partnership has been in our relation with our employees; and we owe a duty to ourselves by laying down as large a stock of coal as we can carry, so that, despite heavy cost and loss by storage, we are in a position to fulfil our obligations to our consumers whatever disturbances may arise.

RESIDUAL PRODUCTS.

So much for coal. It is a relief to turn aside from its consideration to other and more pleasing topics, though its importance is such that it might well have occupied the whole of my remarks this afternoon, to the exclusion of everything else. The price obtained for coke sold in the London area was, on the whole, a fair one. Our policy has been to keep this as far as possible at a uniformly reasonable figure; and we think such a course is more likely to be mutually beneficial to producer and consumer than if advantage is taken of every cold snap or temporary shortage to increase prices. But the main cause of our diminished revenue under this head arises from the price we obtained for the coke sold to the manufacturers of cement. We have for many years past looked to this industry for the absorption of the surplus produced by us, and have sold to them at a reduced rate the balance of our production. This year, too, we had left unexpectedly upon our hands by them a good deal which we had to place elsewhere—a contingency we must endeavour to avoid in the future. Our other important residuals are tar and ammonia. Their production in Europe is an increasing one, largely owing to the recovery plants which are rapidly being installed as adjuncts of coking-ovens. Greater quantities of tar are now, however, being used for dustless road making; and this requirement will largely absorb the surplus. Timber is becoming scarcer, and cannot nowadays be used in the old reckless manner. Even in America it is being found necessary and economical to creosote railway sleepers, &c., and thus prolong their life; and large quantities of creosote are now exported abroad for similar purposes. Increased production probably accounts for the lower price of sulphate of ammonia. It is for most purposes by far the best, as it is the cheapest nitrogenous manure; and it is satisfactory to be able to say that British makers have joined hands with our German friends (or should I say cousins?) for propaganda purposes among prospective users. Till a few years ago, we were large exporters of sulphate of ammonia; but Germany, owing to the great change which has come about in industrial conditions, now makes more than she requires, and exports out of her country as we are exporting out of ours. But we have, as I say, fortunately entered into an arrangement by which we can disseminate the knowledge of the advantages of sulphate of ammonia over any other form of nitrogenous manures to these different countries which are requiring any of it. I may say Japan is one of the largest customers for sulphate of ammonia, and great quantities are sent there from Europe.

IMPROVED WORKING RESULTS.

We have effected a large saving in our requirements of coal, which has come about as the result of improved working in the retort-houses. Some six years ago, I paid a visit to France to inspect the working of some new machinery which had been devised for the purpose of filling and emptying the retorts. The machines were ingenious, although complicated; but I was sufficiently impressed to hand over the problem to one of our own works with instructions to solve it hydraulically instead of electrically. The French engineers had used electric current to transform the power into work; and much the same difficulties had arisen as in the case of the naval gun-designers in working guns in battleship barbettes. In order to satisfactorily convert electricity into work, it is necessary in almost every case to have rapidly running machinery. In the case of lifting a gun, for instance, you can quite understand that the speed of the motions is comparatively small; but a considerable amount of power is required. The same difficulty arose with regard to these stoking machines; and when we adopted the principle of working hydraulically, our engineers at one of the works were able to design and make very successful machines. The works solved the problem very neatly, and many machines (22 or 24 in all) have been constructed to their design. The machine pushes the carbonized coal from the retort instead of pulling it out; and thus we are enabled to fill up the entire retorts instead of partly, as in the old case; and the result is we get a greater yield of gas. Of course, we must not be disappointed if we make a correspondingly less quantity of the residuals. We are gas manufacturers first and foremost; and, broadly speaking, the greater the proportion of the weight of the raw coal we can turn into gas the better. Especially must this be the case if we do not depreciate our residuals in the process. But so far from this being the case, they are improved by the new system of working. The tar is better, the coke is better, and the ammonia is somewhat more. As Chief Engineer, I gave it as my opinion in 1900 that we might look forward to making 11,000 cubic feet of gas per ton of coal. It is satisfactory to know that we have now not only made, but have actually sold, more than this quantity; and the figure referred to in the report does not, I am sure, by any means represent high-water mark.

DISTRIBUTION.

Paragraph 4 refers to the distribution of the gas. The costs attending this do not diminish, nor do I think we must expect them to. We nowadays give the public a much more extended service than was understood by the word a dozen years ago. They want it, however, and although, as shareholders, you might legitimately complain that you are getting no sliding-scale dividend in respect of costs so incurred, yet the general effect is to strengthen and popularize your business (no longer a monopoly) as suppliers of light, heat, and power. And as to the wisdom of such policy, there can be no manner of doubt. To take only one instance, our area of supply extends over more than 50 square miles; and to have but one office through which we and the consumers could get into touch was centralization carried too far, however advantageously that office was placed.

WATER-SLIDE CHANDELIERS.

ood progress has been made in the crusade against water-slide chan-eliers, though it is remarkable how tenaciously some people cling to n appliance whose antiquity dates back to the early days of the last entury. However, if we have not yet succeeded in eradicating them, e have an accurate record where every one exists, and we shall not ease our efforts until the last one disappears. I hardly need recapitu-te the reasons which induced the Board to take the line they have in is matter, except to say that, with the disappearance of this antiquated tting, the claim of gas to be the safest, as well as the cheapest, artifi-al illuminant will be an unanswerable one.

THE SIR GEORGE LIVESEY MEMORIAL.

t our last meeting, I explained how it was that this Company had been alled upon to take its usual leading place in gas matters by heading the und which was being raised in Great Britain and Ireland to perpetuate e memory of your late Chairman. The proposal has taken the defi-ite shape of endowing a Professorship at the Leeds University, which ill be named the "Livesey Chair of Gas Engineering." Sir George, uring his lifetime, made himself personally responsible for the collec-on of certain subscriptions in order to promote research at this centre f technological study; and I cannot conceive any memorial which ould have been more pleasing to him than the one now in contempla-on. It is hoped that the endowment may reach £12,000; and of this, 10,200 has already been subscribed. The Board were very gratified t the enthusiastic manner in which, six months ago, you received their roposal to make the contribution that has been given, and which duly ppears in the present accounts. I feel sure it will become something ore than a recognition on the part of the gas consumer as well as the hareholder of how much both owe to the life-work of Sir George. I onsider it must be looked upon also as an investment made upon their oint behalf which cannot fail to be productive of material advantage o both. But we ourselves shall have our own and personal memorial o the able far-seeing man who established this Company upon the basis which carries it so firmly to-day. And you will no doubt like to hear ow the execution of this is proceeding. Well, I am pleased to say hat Mr. F. W. Pomeroy, in whose hands the work was placed, has odelled an excellent statue, and I believe when you see it in bronze ou will agree that it is not only a good and characteristic likeness, but thoroughly artistic production as well. The model is now in the ounder's hands; and in the late autumn, if all goes well, its erection ill be completed.

INVESTED FUNDS.

Paragraph 6 deals with our invested funds. Our Act of Parliament equires that both the reserve and insurance funds should be invested n what are called "Trustee Securities;" but you do not need our eport to remind you what has happened to this class of investment he last few years. Railways, Docks, Consols, and Corporations' Stocks, &c., have all gone down; and the recovery of their lost position oes not seem to be within measurable distance. The question of epreciating the values at which our investments have been appraised as been before the Board more than once; but the occasion never eemed appropriate. We think, however, the present time is oppor-une; and so we have written down the reserve and insurance funds y, in the one case, £10,614, and in the other £14,113, to their espective market values at the present time. You will see the entries nder Nos. 6 and 8. We have not needed to make any alteration to No. 7, the leasehold renewal fund; and it is an interesting commentary upon this fact to explain that we have been free to invest, and have so nvested it, entirely in our own business.

WARNING AGAINST WORTHLESS COMPANIES.

While upon the subject of investments, there is one matter which I hope you will allow me a few moments to touch upon. There have been some gas companies floated during the past year or so, to which the very mildest expression I could apply would be that their prospects were not particularly rosy. Their prospectuses have, however, been circulated to another public than the ordinary speculator. Lists have been prepared of the names of shareholders in reputable companies such as our own; and to these holders the circulars to which I have referred have been sent—it being assumed, I suppose, that the people would think there is nothing like gas. We struggled against giving these lists of names; but it appeared, from a recent decision of the Courts in the case of another gas company, that there was no alterna-tive; so we had to give way. A little while ago, I received a letter from a firm in which they enclosed a pamphlet and said: "To one interested in raising capital or selling something, the list of 'ladies with honey' is invaluable." Well, it came as a surprise to me that ladies specialized in sweetness until I opened the circular and discovered that the "honey" was of the "Kilmansegg" variety, and that I had mistaken an "M" for an "H" in their letter. Well, especially to our lady shareholders, may I say this: Do not put your money into an unknown gas company because you have happily invested in this one, but go to a stockbroker and ask his advice. It will not be infallible; but it will be honest, which is more than I can say for some of the bubble gas com-panies to which I have referred.

CO-PARTNERSHIP.

Mention is made in the next paragraph as to the Company's co-partnership; and testimony is borne to the help and assistance it has been in the conduct of the Company's business. Twenty years under its advantages have given to our staff and our workpeople an education in affairs, the value of which it is impossible to over-estimate. Contrast what is known now with what was said of it twenty years ago! It was stated then that, by becoming a co-partner, the working man was selling his birthright. To-day you have a loyal and devoted body of employees attached to you by bonds which can best be described in Burke's words "light as air yet strong as iron."

EMPLOYEE-DIRECTOR.

The concluding paragraph of the report refers to personal matters. In Mr. Drumgold we have lost an able Employee Director, whose sympa-thetic and common-sense utterances I am sure you will miss at the half-yearly meeting. But those qualities of heart and mind with which you became familiar are not less valuable in the post of Chief Storekeeper than at the Board-room table. We believe that in Mr. Hunter there has been elected a worthy successor.

NEW CHIEF ENGINEER.

The report also records the selection by the Board of a Chief Engi-neer in the person of Mr. Doig Gibb. From what I have seen and known of this gentleman, I feel sure the choice will prove a wise one, and that Mr. Gibb will fill the position with advantage to the con-sumers, the shareholders, and the employees.

THE REPORT AND ACCOUNTS ADOPTED.

I beg now formally to move: "That the report and accounts now presented be received and adopted, and the report entered on the minutes."

Mr. Robert Morton seconded the resolution.

Mr. E. Kimber said that, before the resolution was put to the meet-ing, he would like to say a few words. He thought the Company were to be congratulated upon their half-year's proceedings. So far as he could see, the Company stood in a strong position. They had in store on June 30 140,000 tons of coal; and as in the half year 570,000 tons were carbonized, they had in store about one-fourth of the half-yearly requirements—equal to about six weeks' consumption. Therefore, had the threatened strike taken place on July 31 last, the Company would have been in a tolerable secure position, having in hand a six weeks' supply with which to fight the strikers. With regard to the statement that this Company obtained 11,000 cubic feet of gas per ton of coal, he recollected having had several discussions with the late Sir George Livesey, who always said that if he could get above 11,000 cubic feet of gas per ton he would be satisfied. But he gathered from the words of the Chairman that the chances were that in future they would get a still larger production, thanks to the perfection of their procedure and the enlightenment, prestige, and scientific attain-ments of their worthy Chairman. With regard to the threatened strike, that was one of the most cruel threats conceivable coming from any body of civilized men. It was impossible to conceive that a body of men like the Miners' Federation should be so wicked as to threaten the whole country, and to overturn and destroy the working of great companies like this and other industries simply out of private pique or malice or ill-will towards people from whom they differed. As he had stated at the meeting of the Gaslight and Coke Company the other day, there was an independent supply of coal which might be brought from New York to Liverpool, free on board, at 5s. 4d. per ton. But Nova Scotia was less distance from the Thames than New York from Liverpool; and they had lately heard from the Government of Nova Scotia that their coal supply could be put free on board at Nova Scotia at 5s. 3d. per ton. If it could be carried to this country for another 5s. per ton—and he was not sure it could not be—they would have coal in the Thames from Nova Scotia at 10s. 3d. per ton, as against the price at present paid by the Company of 12s. 10d. He offered his hearty congratulations to the Chairman and Board for the very success-ful way in which they had carried on the Company's business.

The resolution was carried unanimously.

The Dividend.

The Deputy-Chairman (Mr. J. Ewart) moved: "That a dividend at the rate of 5¼ per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post." As the reasons for the largely increased revenue had been fully explained in the report and in the remarks of the Chairman, he would only say that it was satisfactory to know that this great im-provement was due not to outside causes, such as the lower price of coal or improved prices for coke and other residuals, but to internal economy and improved methods in carbonizing. It was satisfactory to know that gas still continued to successfully meet all competition, whether as a form of power or as an illuminant; and he doubted whether the resources of the industry were even yet fully realized.

Mr. J. D. C. Hunter (an Employee-Director) said that all would benefit by the result of the satisfactory half-year's working. Most gratifying of all, the employees would receive their share in the shape of a 7½ per cent. bonus on their wages and salaries. Secondly, con-sumers were receiving gas at a reduced price, and shareholders were to be paid the full statutory dividend. As also a large balance was to be carried forward, the Company were in a very good position in-deed. Personally, he benefited by the satisfactory working in a three-fold manner; for besides being an employee, he was also a consumer and a shareholder. The co-partnership scheme was a greater success than it had ever been—its roots, like those of a tree, being deeper struck and its branches wider spread than ever before. He felt it a great honour to stand there to second the resolution, and the position was to him one of great pleasure.

The motion was adopted, and the business of the meeting concluded.

Votes of Thanks.

Alderman Howlett said he thought they should not separate with-out passing a very hearty vote of thanks to the Chairman and Board for their assiduity and attention to the affairs of the Company. They had a capital, even a magnificent, report; and no doubt there was better yet to follow. In the matter of gas-making there could be no standing still—they must either go forwards or backwards; and the policy of the Company was the forward one. They were not here to-day to discuss the sources from which they could obtain cheap coal in the future. A good many other things came into play, whether, for instance, the coal would make a good coke, which was a very interesting subject to him-self especially. There was some coal which made abominably bad coke. For this reason he hoped that things would work smoothly and keep at their present level. No doubt the improvement in machinery had contributed to the fact that they had never had a better residual in the shape of coke than they had to-day; and he was glad the Company should have a good character for fuel of this sort. The hand of the Chairman was very largely impressed on the report. Nothing he had done in connection with the Company had been done in a hurry. He was always moving slowly but surely; and no doubt the very important improvements which had come about had been largely due to his industry and ability. The Company were peculiarly fortunate, having lost one of the best men the world had ever seen from the engineering and gas-making point of view, in being able to fill his place by one so

admirably adapted for the position as the present Chairman. With regard to the other members of the Board, whom they had known for many years, they were all good men and true—not mere guinea pigs, but men engaged in the earnest work of the Company, and with money invested in it.

Mr. W. Stott seconded the resolution, observing that he felt, with Mr. Howlett, that the Company were very greatly served by the present Board, and were especially happy in their choice of a Chairman to follow Sir George Livesey. Shareholders would agree that the society or Company to which they belonged was in a very flourishing condition whatever might be in store in future. He himself was very optimistic about the coal business, having travelled in America, where there were tremendous beds of coal. He looked forward to by-and-by seeing steamers bringing coal from there. Though he had no doubt our own supply would last us a couple of hundred years, there would be an advantage in getting coal from America.

Alderman Howlett put the resolution, which was carried by acclamation.

The Chairman, in acknowledging the compliment, said the Board were "united" in every sense of the word. Different qualifications were represented on it, and as the result the shareholders had their business managed in a manner which he was pleased to think they considered satisfactory. He must not, however, sit down without proposing a vote of thanks to the hard-working and loyal staff which played so important a part in achieving these satisfactory results. He could not on this occasion ask both sides of the business to respond—only the commercial element being represented here. But Mr. M'Leod, fortunately, had other qualifications than that of the commercial man—he had technical knowledge, which was very useful to him in the position he occupied. On the next occasion, the engineering side would be represented by the new chief—Mr. Doig Gibb.

Mr. E. Kimber seconded the proposal. Anyone who knew anything about gas-works must know the enormous risks to health and sacrifices of comfort workers in gas-works must undergo. Shareholders might be glad to hear that he did not represent the capitalist, though he had spoken so strongly. He represented the Trustees of three large charities holding £20,000 of stock, all of whom were among the servants of the poor, and especially workmen in gas companies who required attention in hospitals.

The motion having been adopted,

The Secretary (Mr. M'Leod) acknowledged the compliment, and said that an additional reason for the satisfaction expressed was that outside the official staff there were 5000 employees holding stock in the Company. This meant that the interests of employees and shareholders were identical, and that the employees would do everything in their power to maintain the high efficiency the Company had secured.

BOURNEMOUTH GAS AND WATER COMPANY.

Half-Yearly Report and Accounts.

In the report which the Directors of the Bournemouth Gas and Water Company will present at the half-yearly meeting next Friday, they state that the volume of business done in both gas and water in the six months ending the 30th of June, shows a satisfactory growth in comparison with 1908. Residuals fell in price; but coal cost somewhat less. The accounts accompanying the report show that the revenue from gas was £48,680, and from water £18,754; the total receipts being £83,320. The expenditure (including £1075 for the co-partnership scheme and expenses) was £60,106; leaving £23,214 to go to the profit and loss account; compared with £21,692 at the end of June last year, though the price of gas was reduced 3d. per 1000 cubic feet in October last. The balance available for distribution is £37,260; and the Directors recommend the payment of dividends (less income-tax) for the half year at the rates of 6 and 7 per cent. per annum on the preference and "B" ordinary shares respectively, and at the rate of 15 per cent. per annnm on the original share capital of £50,000. These dividends will amount to £16,913, and leave £20,347 to carry forward.

The statements relating to the working results show that, under the supervision of Mr. Harold W. Woodall, the Engineer and General Manager, 19,452 tons of coal, and 418,038 gallons of enriching oil were used in the production of 375,950,000 cubic feet of gas, of which 348,080,182 cubic feet were sold and 358,621,272 feet accounted for. The residuals produced were: Coke, 11,360 tons; breeze, 1770 tons; tar, 230,242 gallons; sulphate of ammonia, 172 tons.

Additional Storage at the Camborne Gas-Works.—At the invitation of the Directors of the Camborne Gas Company and Messrs. Willey and Co., of Exeter, a large gathering took place at the Tuckingmill Gas-Works last Thursday to inspect a new gasholder. The tank is 63 ft. 6 in. in diameter and 20 ft. 6 in. deep, and the holder 60 feet in diameter. Its capacity is 100,000 cubic feet; and the tank will hold 406,000 gallons of water. Mr. H. P. Vivian presided at a luncheon served in the holder; among those present being Messrs. F. T. Depree (Chairman of Messrs. Willey and Co.), S. J. Ingram (the Company's Consulting Engineer), W. J. Couch (the Secretary), and C. C. Veale (the Works Manager). Mr. Depree proposed "The Camborne Gas Company," and in responding, the Chairman said since twenty years ago the annual make of the Company had increased from 8 to 23½ million cubic feet. He regretted the death of Mr. W. Bailey, who was Manager for forty years. Mr. Ingram said there was a greater mileage of gas-mains in Camborne than in any other town in Cornwall. The recent increased assessment of the Company's premises meant an additional cost of 1d. per 1000 cubic feet; and at present they paid in rates and taxes 2½d. for every 1000 cubic feet of gas manufactured. This tended to keep up the price of gas; but the Directors were determined to do everything possible to reduce the cost of production. Mr. C. Bryant proposed "The Contractors." Mr. Depree, in responding, said by the death of Mr. Bailey he had lost a personal friend, and the Company an efficient servant.

COMMERCIAL GAS COMPANY.

The Ordinary Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. Bradshaw in the chair.

The Secretary (Mr. H. D. Ellis) read the notice convening the meeting; and the Directors' report and the accounts (which were given in the "Journal" last week) were taken as read.

Directorate Changes.

The Chairman, in moving their adoption, said: I must preface the remarks I have to make to you to-day with an expression of sincere regret at the loss the Company have sustained since we last met you in the death of our colleague, the Right Hon. Sir John Colomb. Sir John had been a Director since the year 1890; and during the nineteen years which have elapsed, he has rendered to the Company much valuable service. He was not an engineer by profession, nor had he received a business training in the strict sense of the word; but he was a most useful Director, because he brought to the consideration of our business a wide knowledge of men and affairs, and such a fund of shrewd common sense, that he enriched every discussion which took place at our Board, and broadened the view with which every question was regarded. As I say, he was a most useful Director; and we shall long miss his services. We have elected in his place, Mr. Henry Willingham Gell, whom you appointed as an Auditor some five years ago. It is said that "imitation is the sincerest form of flattery;" and I think therefore the Directors have paid the proprietors a compliment in following the lead they gave us in making Mr. Gell an Auditor.

SIGNS OF TRADE IMPROVEMENT.

Now turning to the affairs of the Company during the past six months, I think you will agree with me that the half year compares favourably with the corresponding half of 1908. When meeting this time last year, we had to tell you that our profit fell short of our dividend by no less than £7349. Now I have the pleasure of informing you that the profit exceeds the dividend by £2070. Last year I had to report for the first time for some years that we had a decreased sale of some 27 million cubic feet of gas. Now I am pleased to tell you we have an increased sale of 36 million cubic feet. This time last year we were passing through a period of depressed and declining trade; and the outlook was, to say the least of it, somewhat unfavourable. On all sides now, I think we have signs of improvement. In America—whence we get very often our trade as well as our weather—the manufacturers are building fresh factories and increasing their machinery and staffs. A gentleman high in the commercial world said two or three days ago that a boom in trade was not only coming, but had already arrived. I was present at a dinner the other night at the Mansion House to the bankers of the City of London when the Chancellor of the Exchequer spoke; and the whole of his speech was occupied in dealing with what he considered to be signs of improvement throughout the country. If you look at the Board of Trade returns, you will see that, for the first time for eighteen months, in the month of June our exports were up by ¾ million; and the July returns are yet still better, because they have improved by no less than 1¾ millions. You can find an echo of this in our own accounts, because our bad debts—a sure barometer of the trade weather—are less than they were last year.

COAL, THE ONLY CLOUD.

The only cloud upon the horizon is the uncertainty existing in the coal trade, and the unrest, which appears to be a perennial malady, among the miners. It is true that a coal strike over the Scotch differences has been happily averted; but we have yet to feel the effects of the Eight-Hour Act, and the demand for higher wages which is certain to accompany, and will probably precede, improved trade. But turning for a moment from what may be to what is, you will be gratified to know we have bought our coal and oil at considerably lower prices; and we expect during the current year to make a large saving in that respect. Of course, you must bear in mind that whatever saving we make will be modified and lessened by the smaller return coke will give us.

A CHANGING BUSINESS.

If you will look at the accounts for a minute or two, you will see we have spent £8355 on capital account, and have a credit of £808. This is rather unusual, and I will explain it. We sold a small strip of land, part of our old Stepney works, to the London County Council, for the widening of the bridge over the Regent's Canal. This produced £700; and the balance of £108 is for meters taken into stock, and therefore credited to capital account. The whole of the £8355 that was expended on capital account was laid out in providing distributing plant, which represents new business. We fixed 1492 additional stoves, and 3548 additional coin meters; but our ordinary meters were less than they were this time last year by 231. I am very sorry for this. A decrease in the ordinary meters always disappoints me. I told you just now our sale of gas has increased by 36 million cubic feet. Actually we sold through coin meters 40 millions more; but through ordinary meters, nearly 4 millions less. So you see our business is undergoing a change. We are selling more gas in pennyworths; but less gas to our credit customers. When I first joined the Company (I think I am right in saying), practically all the gas was sold after dark. Now 50 per cent. of the gas being sold is consumed during the hours of daylight. A very large proportion of this is used for fuel—in fact, not only do we sell gas for driving gas-engines, but—this is another industrial use that has come to us—for the purpose of heating crucibles. The Directors were interested the other day in going round the works to see that our outdoor department were beginning to manufacture their own gas pendants, and were executing a large order for one of the Company's customers—smelting their own brass, making their own castings, and doing it all by the aid of a gas furnace.

ILLUMINATING TEST OBSOLETE—REGRETTING CALORIFIC TEST.

Of course, the change in the use of gas to my mind renders the illuminating test and penalties for that test altogether obsolete; and the competition to which we are now being subjected from cheap oil and

ectric light renders a test absolutely unnecessary. We are bound to rovide the best article we can manufacture at the very lowest price, or e could not compete with our trade rivals. All tests are detrimental oth to the Company and to the consumers, because they tend to inder the Company from providing the article that the public require. 'he days of monopoly, when a gas company could snap their fingers at ie public, are ended; and they will never return. We realize now iat we must give if we want to get. The high road—the only road— prosperity is to provide the cheapest possible gas at the cheapest ossible price. I say this because I have seen, with the greatest regret, iat one of the London Companies, under the exigencies of a fight in 'arliament, has accepted a penalty calorific test. I believe that is a etrograde step; and I view it with regret. There is no longer necessity or tests; indeed, tests are harmful to the public whom we supply.

PRICE OF GAS.

: is our great regret—and it is the only regret of the half year—that we o not see our way to reduce the price of gas. We are charging the ioderate price of 2s. 6d.; and it would have given us pleasure if we ould have brought that down. When I tell you that a reduction of 1d. er 1000 cubic feet represents £6617 in a half year, and that our surplus rofit over the dividend is only £2070, you will see we are not in a osition to reduce the price without depriving you of some part of your ividend. You may rest assured, however, that the Board will take the rst opportunity of reducing the price, and so increasing your dividend nd the bonus we pay to our co-partner employees.

GOOD WORK IN THE MANUFACTURING DEPARTMENT.

'urning to the revenue account, I have said that we manufactured in he past half year 36 million cubic feet more than in the corresponding ialf of 1908; and the cost of manufacture was £13,551 less. Actually, ve spent in the purchase of coal and oil, and in bringing them into our vorks, £13,127 less. Although we manufactured so much more gas, ve used considerably less raw material. This speaks volumes for the cientific work accomplished by the Engineer, and the energy and the goodwill of the men who work under him. And I may point out that our carbonizing wages which were £14,943 in the past half year, were £16,639 in the corresponding period of last year; so that there has been a saving there of £1695—another indication of good and willing work. Some of you will have seen in the technical press references to the new carbonizing methods. Gas engineers are beginning now to use rather larger charges in their retorts, and to subject them to heat for a rather longer time, with good results. I only mention this, in order that I may tell you our Engineer is not behind any other engineer in this respect. He is making experiments at two of our works, which experiments have been very satisfactory indeed—in fact, I may tell you the make per ton is no less than 11,403 cubic feet, which those who follow gas affairs will recognize as a very good figure indeed. I ought perhaps to warn you that this figure may not always be reached, because the make per ton must be dependent, to a large extent, upon the quality of the coal with which the Directors supply their Engineer. We may not always be able to get, or buy profitably, such good coals as at the present time.

HALF-YEAR'S REVENUE.

Our sale of gas produced more by £4540, which is the equivalent of the 36 million cubic feet extra gas sold. The increase amounted to 2·33 per cent. on the sale of the corresponding half year, when we had to come and tell you we had sold less gas than the previous year. I am glad therefore to see this satisfactory addition to the business. While we had this increase, our neighbours the South Metropolitan Gas Company had an infinitesimal decrease; and the Gaslight Company an increase of about ⅔ per cent. So that our 2·33 per cent. increase compares very favourably indeed with our neighbours. It is true, as I have pointed out, the increase is due, in large measure, to the additional stoves and coin-meters we have fixed. The rental from stoves and meters is £1722 more; but residuals—coke, breeze, tar, and sulphate of ammonia—produced less by £7991. Coke and breeze yielded less by £9816; but tar and sulphate gave us £1824 more. Thus the total receipts were less by £1758. But then we spent £10,705 less; so that the profit is more by £8947—being £63,922, compared with £54,974 this time last year.

A SATISFACTORY RESULT.

Turning to the net revenue account, interest amounts to £9026. Of course, the interest balance tends to go up, because the borrowing from the bank is much larger than it has been; but we pay our bankers less interest than we should pay the proprietors if we issued more stock. Therefore it pays us to let the balance run up a little. Interest amounting to £9026 leaves £54,896 as the half-year's profit available for dividend. Paying the dividends at the ordinary rates of £5 4s. per cent. per annum on the 4 per cent. stock and of 5 per cent. on the 3½ per cent. stock will absorb £52,825, and leave a surplus of £2070. We brought forward £20,988 into the half year, and we carry forward to the current half year undivided profit amounting to £23,059. I think you will agree that this is a result which is very satisfactory in itself. In one respect it is disappointing to me—that is, because it does not justify us in reducing the price of gas. In conclusion, I may say that our works are in first-rate order, and amply sufficient for our requirements, and that our relationship with the men is everything that can be desired. I believe, too, that the prospects of the Company were never better than they are at the present moment.

The DEPUTY-CHAIRMAN (Mr. Walter Hunter), in seconding, said he should like to join in the expression of regret at the deep loss the Company had had in the death of their friend and colleague Sir John Colomb. He had known Sir John perhaps longer than anyone else in the room, both as a friend and as a colleague; and he was everything one could desire. The Directors, he should like to add, had a very satisfactory meeting the other day at Stepney with the Co-partnership Committee; and he was more convinced than ever that the scheme was doing excellent work for the Company.

Mr. ENNIS said he had been very interested in, and was fully alive to the importance of, the consummation of the equalization of the day and night consumption. The Chairman had expressed regret at not being able to reduce the price of gas. The proprietors were always glad when the price could be reduced; but he personally felt that a reduction was a thing into which they should not rush prematurely. He understood from the Chairman that 1d. reduction represented about £12,000 a year. That was a goodly sum in the total; but 1d. reduction nobody hardly felt. He thought that it would be better for their business if a portion of the £12,000 a year was devoted to giving greater facilities to the poorer of their consumers.

The CHAIRMAN, in thanking Mr. Ennis for his kindly remarks, said the Company did look after the poorer consumers in identically the manner indicated. The slot consumers paid them extra for their gas; but it cost the Company a great deal more than that in providing and fixing the services and fittings. If the consumers liked, the Company also provided and fixed mantles for them at cost price. The little extra obtained for gas sold through the coin-meters did not actually compensate the Company. It was really an expensive form of selling gas. The 10d. extra did not represent the whole outlay made. Therefore they were sacrificing something on behalf of the small consumers; and they did everything they could to encourage and help them.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, the dividends mentioned in the Chairman's address were declared, less income-tax.

ELECTION OF NEW AUDITOR.

The CHAIRMAN said the proprietors had had notice that two fully qualified proprietors—Mr. B. W. Ellis and Mr. B. M. Gill—had given notice of their intention to seek election, to fill the vacancy caused by the elevation of Mr. Gell to the Board. He (the Chairman) had had a letter from Mr. Gill stating that he had no wish to put the proprietors to the trouble of a contested election; and so he withdrew in favour of Mr. Ellis.

Mr. DAVIES formally proposed, and Mr. FARNAN seconded, the election of Mr. Ellis as an Auditor.

Mr. WILKINS pointed out that the proprietors had not the slightest information concerning Mr. Ellis.

Mr. DAVIES remarked that Mr. Ellis had been a proprietor for more than twenty years, and had been connected with several other gas companies.

ANOTHER PROPRIETOR asked if Mr. Ellis was a relative of the Secretary?

The CHAIRMAN: He is a son.

The motion was carried *nem. con.*

Mr. ELLIS thanked the proprietors very much for electing him as one of the Auditors, and assured them that he would give his best attention to the duties of the office. He had also to thank Mr. Gill for withdrawing his candidature; and thus saving the proprietors a contested election.

VOTES OF THANKS—THE WORK OF CO-PARTNERSHIP.

Mr. ENNIS proposed a vote of thanks to the Chairman and Directors; and, in doing so, said he was sure the proprietors desired to associate themselves with the expressions of regret from the chair as to the loss of such a man of distinction as Sir John Colomb.

Mr. WILKINS seconded the motion; and it was unanimously carried.

The CHAIRMAN having acknowledged the vote, proposed a similar compliment to the Secretary, the Engineer, staff, and employees of the Company. He could only say that during the past half year they had received the most willing and effective service from them all. Mr. Hunter had referred to the meetings with the Co-partnership Committee, which consisted of twelve members nominated by the Board and twelve members elected by the men. It was some years ago since they first met. He could say that at that time he did not look forward to the meetings with a great deal of pleasure; but now he regarded them as one of the most pleasurable times in the whole year. The men understood the Board; and the Board now understood the men. Profit-sharing had brought them together; and they felt their interests were identical. It might interest the proprietors to know how profit-sharing had benefited the men, without imposing an undue tax on the Company. The first year they had £4000 to their credit in the Company; now they had £44,000 standing to their credit. The Directors frequently had instances of the benefit the savings in the Company were to the men and their families. In every sense of the word, co-partnership with them had been a great success. He was gratified to see how it had extended all over the country. He believed that Sir George Livesey, when he introduced co-partnership to the gas industry, really hit upon something that would bring capital and labour together.

The DEPUTY-CHAIRMAN seconded the motion; and it was heartily carried.

Mr. ELLIS, in acknowledging the vote, said this was the sixtieth half-yearly meeting at which he had had the pleasure of responding to this vote. He was happy to say that, during the whole of the thirty years, he had been blessed with health and strength, and had never been absent for a single day through ill-health. The clerical staff—particularly Mr. Bradford, the Accountant, and Mr. Maddocks, his own assistant—richly deserved the acknowledgment that had been made of their services by the proprietors.

Mr. STANLEY H. JONES, replying for the engineering staff, thanked the Chairman very cordially for the kind expressions that had fallen from his lips. Of course he (as Engineer) could not do his work properly unless he was supported by a good staff and willing workmen. The relations between the men, the officers, and the Board were of the most satisfactory nature; and he could endorse all the Chairman had said as to the Co-partnership Committee meetings.

The CHAIRMAN observed that it might interest the proprietors to know that in 1879, when Mr. Ellis joined the Company, they sold 1375 million cubic feet of gas; last year, they sold 3122 million cubic feet, or much more than double what they did thirty years ago.

At a recent extraordinary meeting of the Skegness Gas Company, it was decided to raise £3000 of additional share capital, in £5 shares, in accordance with the Company's Orders of 1902 and 1907.

WEST HAM GAS COMPANY.

The Final Half-Yearly Meeting of this Company was held last Tuesday, at the Liverpool Street Hotel, E.C.—Mr. J. Lister Godlee in the chair.

The Secretary (Mr. A. G. Snelgrove) read the notice convening the meeting, and the Directors' report and the accounts were taken as read.

The Last Ordinary Report.

The Chairman, in moving the adoption of the report and accounts, said the former began with the words: "This will in all probability be the last ordinary half-yearly report the Directors will present to the stockholders of this Company." Had the report been dated that day, instead of July 27, the sentence would have stood as follows: "This is the last ordinary half-yearly report to be presented by the Directors of this Company to the stockholders." The Act for the amalgamation of the Company with the Gaslight and Coke Company had been read the third time in the House of Lords, with some slight amendments. These amendments had been agreed to by the House of Commons; and nothing further was needed but the Royal Assent, which, in a case of this sort, was a formality. He anticipated it would be given next week. It seemed best to preface what he had to say that day by this statement. While the prospect of the change that lay before them had had its influence on all their proceedings during the past half year, the fact that a probability had become a certainty would have its influence on the way he and the proprietors would speak of matters connected with their Company that day.

A PROGRESSIVE BUSINESS.

Looking now for a few minutes into the doings of the past half year, and keeping in mind the fact that they had been selling gas at 2s. 8d. per 1000 cubic feet this year, against 2s. 9d. in 1908, he thought the proprietors could not fail to be satisfied that the Company were still in a sound position, and were continuing to increase their business in a very satisfactory manner, as they had so long been doing. The sales in the half year showed an increase of 5·48 per cent. over the corresponding half of 1908, in which, having been leap year, there was one more day than in the past half year. The receipts for gas and rental of meters were £5600 more than in the June half of last year. Coal and oil had cost less; and the alteration of the sulphur clauses had caused a marked reduction in the cost of purifying materials, as would have been noticed. The Directors had continued the charges for depreciation on the same scale as in former years, having for the half year written off £21,000; and, in the result, the profit carried to the net revenue account was £35,276, or only £565 less than a year ago. Comparing the result of the half year with that which ended last Christmas, they then had to draw £2950 from the undivided profits to pay the dividend. Now they could pay the dividend, and add £1264 to the undivided balance—a better result by £4214. The Directors had made contracts for coal for the future at a reduced price. But it was not easy at the moment to say how the values of residuals would work out. This half year they showed a material reduction from the sum they produced a year ago; and he was afraid they must anticipate some further reduction, but not, he thought, sufficient to counterbalance the saving that would be made in coal and oil.

CANNEL, A RELIC OF THE PAST.

He did not know whether any of the proprietors had noticed that one small item—a relic of the past, so far as this Company were concerned—had altogether disappeared from the accounts. The stock of cannel coal had been exhausted. The last purchase of this coal was a lot of 1000 tons in the year 1900. By the end of 1901, this stock had been reduced to 381 tons; in the next seven years, they used 220 tons; and the 160 tons left last Christmas, their Engineer (Mr. John C. Wright) had cleared off during the past half year, so as to get rid of it. The reduction of the illuminating power of the gas after the Company's Act of 1902, practically did away with the need for this stimulant.

SALIENT FEATURES.

He did not think it necessary at the summer meeting to trouble the proprietors with any long array of figures. He had quantities of them before him which were very interesting to study, and which showed a very satisfactory state of their affairs. But it would be impossible to make them interesting to the proprietors in a speech, nor did he think any really good object would be attained if he attempted to do so. He might just mention that the fixed capital had been reduced from 12s. to 11s. 9d. per 1000 cubic feet sold; that there was some increase in the carbonizing wages from a temporary cause, which would not recur; and that the number of ordinary consumers had increased since last year from 22,700 to 22,880, and slot consumers from 36,187 to 41,860.

THE AMALGAMATION—WEST HAM AND CALORIFIC POWER.

It would be quite understood that he had no report to make to the proprietors of any fresh undertakings entered upon, or any big plans for the future. The probability (which, as time went on, became more and more a certainty) that amalgamation with the Gaslight and Coke Company would become a fact, naturally prevented the Board entering upon considerations of that kind. When the Directors last met the proprietors, the Bill had passed the House of Commons; and its progress in the House of Lords since then had been a more rapid one. The Corporation of West Ham was the only opponent that appeared in the Committee room; and after a comparatively short hearing, the preamble was held proved. The only amendments of any consequence were two in favour of West Ham which the Gaslight Company agreed to—one making provision for a testing-station in Canning Town, and another extending the right to test the calorific power of the gas to be supplied in the West Ham district—the clause as passed in the House of Commons appearing to confine this to the London district. Neither of these changes was of special interest to the Company. No opposition was made in the House of Commons to agreeing to these amendments; and, as he had said earlier, the Bill now only awaited the Royal Assent. On Jan. 1, the stockholders of this Company would find themselves stockholders in the premier gas company of the world, with, as he confidently believed, even brighter prospects before them than they could have anticipated had they gone on as they were. Before the accounts for the current half year had been made up, this Company would have ceased to exist. When they were made up, the Gaslight Company would pay to the persons who were holders of ordinary stock of this Company on Dec. 31, a dividend for the half year at the rate at which—regard being had to the available profits of the Company—it would have been paid if the Amalgamation Act had not been passed; but the Directors would have no opportunity of coming before the proprietors with any report or accounts. It seemed, however, to the Board that, to have their last meeting with the proprietors now, would have been somewhat out of time, and that to say "Good-bye" at this meeting to those of the proprietors who had been good enough to attend the meetings, would have been like having a breaking-up party in the first month of the term. The Directors would have their ordinary work to do during this half year as usual; and probably there would be many matters to arrange and settle in preparing for the transfer of the one concern to the other. They therefore proposed to summon a special meeting nearly at the end of the half year, and to report to the proprietors then as to their proceedings, and the final arrangements for closing up the affairs of the Company. He should not therefore on this occasion bid the proprietors "Adieu," but only add that the business of the Company showed signs of a good increase since the end of the last half year; that the temporary arrangements made for carrying on the business of the Company after Mr. John Clark's death appeared to be working very well; and that there seemed every sign of the Company passing over to the larger Company in a healthy and vigorous state.

A PERSONAL MATTER.

Before he sat down, he wished to refer to one matter personal to himself. As the proprietors knew, the Act provided for one of the Directors of the West Ham Company having a seat on the Board of the Gaslight and Coke Company. His colleagues had done him the honour of expressing the wish that he should occupy that position; and, a vacancy having occurred on the Board of the other Company, it was suggested that he should be elected to fill this vacancy at once—thus in effect antedating his nomination under the Act. He was now, therefore, a Director of the Gaslight and Coke Company. He need hardly say that he did not accept the position without consulting his colleagues, and only accepted it after they had considered the matter and decided that the interests of the West Ham Company, and those concerned in it, were not in any way likely to suffer by his occupying for six months the dual position. He hoped he should not appear presumptuous if, after his short experience of the Directors of the other Company, he said that he thought the stockholders of this Company might be thoroughly satisfied that their affairs would, after the change, be in very good hands.

The Deputy Chairman (Mr. H. Cecil Pelly) seconded the motion; and it was unanimously adopted.

The Chairman proposed the declaration of dividends at the rates of 5 per cent. per annum on the preference stock and £5 7s. 6d. per cent. on the consolidated ordinary stock.

Mr. Fred. Nicholson, in seconding, remarked that he did so with a certain amount of regret, because this would be the last dividend to be declared and paid by the West Ham Gas Company. But, happily, they could go away fully confident that the amalgamation would prove beneficial to the stockholders and consumers of the Company.

The proposition was agreed to.

Mr. F. H. Pilley moved a hearty vote of thanks to the Chairman and Directors for the manner in which they had conducted the affairs of the Company, more particularly in view of the arduous duties they had had during the last six months in anticipation of the amalgamation. He should like to couple with the motion the Secretary and officers of the Company, and especially their Engineer (Mr. Wright) who was suddenly called upon to bear the whole responsibility of the engineering department of the Company. The proprietors were glad to know he had carried out the work efficiently without calling in outside advice.

Mr. W. Beaumont seconded the motion; and it was heartily passed.

The Chairman, in the course of his reply, said there had naturally been a good deal of extra work during the half year. There had been a considerable amount of work outside the West Ham Board Room; for some of them, it had been transferred to the House of Lords and the House of Commons Committee rooms. But they were satisfied they had been working for the good of the Company, and for the good of the proprietors. The work had all been done with good will; and they were glad the result was as satisfactory as it had been. He was pleased Mr. Pilley said what he did as to the officers. They had worked hard and strenuously; and the Company had not had more thoroughly good work from them for many years. Mr. Wright was indeed deserving of special thanks from the proprietors in taking up the work as he did—not only the work in which he had assisted Mr. Clark for years, but the increased responsibilities that fell upon him at this special time. The work had been done very satisfactorily.

Both the Secretary and Mr. Wright expressed appreciation, on behalf of themselves and their staffs, of the kind words spoken.

Mr. W. Edgar, in the name of the proprietors, congratulated the Chairman on becoming a member of the directorate of the Gaslight and Coke Company, and expressed the hope that he would live long to retain the position.

The Chairman observed that, on this occasion, he could not help feeling a sense of personal obligation to those friends who had met him there for so many years. It tinged the satisfaction he felt with regret that he would have to do this so seldom again. At the same time, it was good of the proprietors to mention his position in the other Company; and he hoped that his occupying that position would help to settle matters between the two Companies during the next six months. He thanked them all most heartily.

The Gas Committee of the Walsall Corporation have decided to recommend an extension of the area of supply to include Pelsall and High Heath, at an estimated cost of £3365.

CROYDON GAS COMPANY.

Half-Yearly Report and Accounts.

In the report to be presented at the meeting of the Croydon Gas Company next Friday, the Directors state that the sales of gas exceeded those of the corresponding period of 1908 by 2·5 per cent. The number of consumers increased in the half year by 823, and that of stoves on hire by 1244; and 155 stoves were sold to consumers. In 1902, the system of maintenance by the Company of consumers' incandescent burners at an inclusive charge was introduced. The Directors have now decided that, as from the Michaelmas quarter, this service shall be given free; the only charge made being for the materials used. Free afternoon and evening lectures and demonstrations on cooking by gas have been given in Croydon, Purley, and Wallington. These have been well attended; and it has been proposed to hold further lectures in the autumn.

The accounts accompanying the report show that the total revenue was £116,358, of which £84,653 was derived from the sale of gas, £8646 from the rental of meters and stoves, and £22,943 from the disposal of residuals. A sum of £58,367 was expended on manufacture, and £17,041 on distribution; rent, rates, and taxes came to £4424; management cost £4192; and the total expenses (inclusive of £644 for the co-partnership scheme) were £89,258. The balance carried to the profit and loss account is £27,099; and the amount available for distribution is £29,176. The Directors recommend the payment of dividends at the rates of 14½, 11½, 10, and 5 per cent. per annum, all less income-tax, on the various classes of stock. This will absorb £22,624, and leave a balance of £6552.

The statements relating to the working show that, under the supervision of Mr. J. W. Helps, the Engineer and General Manager, 40,397 tons of coal and 552,221 gallons of oil were used during the half year to manufacture 659,317,000 cubic feet of gas, of which 620,752,900 feet were sold and 628,995,500 feet accounted for. The estimated quantities of residuals produced were: Coke, 24,238 tons; breeze, 6070 tons; tar, 476,452 gallons; ammoniacal liquor, 1,146,708 gallons—the make of sulphate being 484 tons.

Attached to the report is the "Warning" slip in regard to the issue of lists of shareholders to promoters of unsound companies to which reference was made in connection with the report of the Wandsworth and Putney Gas Company in the last number of the "JOURNAL."

PORTSEA ISLAND GAS COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held last Saturday, at the Offices, Commercial Road, Portsmouth—Alderman Sir JOHN BAKER, M.P., J.P., in the chair.

The SECRETARY (Mr. H. A. Stibbs) having read the notice convening the meeting, the report and accounts for the half year ending the 30th of June were presented. The report showed that the revenue was £110,297, compared with £112,885 in the corresponding period of last year. The total expenditure was £90,772, against £96,569; and the amount carried to the profit and loss account was £19,525—an increase of £3200. Exclusive of a sum of £5960 in the extraordinary renewals account, the profit and loss account showed an available balance of £40,463, from which dividends were recommended at the rates of 13, 12, 10, and 5 per cent. per annum on the varying descriptions of shares and stock, less income-tax. The balance to be carried forward was £22,531. The Directors stated that the demand for gas had been well maintained, the number of consumers had again increased, and an additional number of cooking and heating stoves had been fixed. Regret was expressed at the death of Mr. Howard Charles Ward and at the resignation of Mr. Charles Cole, two of the Directors; and it was notified that to the vacancies Messrs. T. Scott Foster and T. H. F. Lapthorn had been elected. Though the Admiralty had required the removal of the jetty at the Flathouse works, the Company's right of access to the sea still remained; and satisfactory arrangements for continuing the delivery of seaborne coal had been made. The business of the Portsea Island Gas-Fittings Company, Limited, had been acquired, and the settlement had been concluded on the terms agreed upon at the preceding half-yearly meeting. The working statements showed that the quantity of coal and cannel carbonized was 54,327 tons, and 481,721 gallons of oil were used. The make of gas was 676,991,000 cubic feet, of which 629,789,900 cubic feet were sold and 640,031,300 cubic feet accounted for.

The CHAIRMAN, in moving the adoption of the report, briefly congratulated the shareholders on the continued normal trading by the Company, and subsequently eulogized the services which Mr. Cole and the late Mr. Ward gave to the undertaking for a long period.

The DEPUTY-CHAIRMAN (Mr. R. E. Hellyer) seconded the motion.

In the subsequent discussion, the report, which showed a lessened total income of upwards of £2000, was adversely criticized. Attention was also called to the manner of electing the Directors. One speaker remarked that the existing system was a perfect farce; and another complained that upon the Board there was not a *bonâ fide* representative who had been proposed by the shareholders—the whole of the members being the nominees of the Board itself, upon which the late Chairman had secured seats for both of his partners (one being the present Deputy-Chairman), while the present Chairman had secured a seat for his own son, a second for a brother Alderman, and a third for a political colleague for rendered services in the political world.

The CHAIRMAN defended the action of the Board as being in accordance with law, and said that if the present system were abandoned it would result in nothing but a scramble for the seats.

The resolution was then adopted.

The fees of the Auditors were raised from £80 to £100, on account of the alleged extra work put upon them in auditing the accounts of the Fittings Company.

Mr. H. B. MORRIS drew attention to the fact that by the absorption of this Company the members of the Board who were also Directors of the defunct Company were losing £150 a year in fees; and as the transfer of the business had added to their duties and responsibilities as Directors of the Gas Company, he proposed that their remuneration should be increased by the amount they had voluntarily forfeited.

No argument against the proposal was raised; but notwithstanding that the Auditor's fees had immediately before been increased on precisely the same grounds, the motion was outvoted by two.

A resolution authorizing the payment of the dividends recommended was unanimously agreed to; and the meeting terminated with the customary complimentary vote to the Directors and staff.

PROFIT-SHARING SCHEME AT GLOUCESTER.

The First Year's Working.

It will probably be remembered that a profit-sharing scheme was inaugurated last year by the Gloucester Gas Company; and on Monday, the 9th inst., the first annual meeting of members was held, at which a report of the first year's work was presented. After the meeting, members and their friends, to the number of 200 (including ladies), were entertained at tea in a marquee at the gas-works, situated at Hempsted, near Gloucester. Mr. J. H. Jones (the Chairman of the Profit-Sharing Committee) presided, and in proposing "Success to the Gloucester Gas Company's profit sharing and saving scheme, and health, happiness, and prosperity to all its members," expressed the regret felt by all that their Chairman, Mr. Vassar-Smith, was not present. His sympathies, however, were entirely with them; and he wrote saying that he felt sure the meeting must be most valuable, and productive of good results. Referring to the working of the scheme for the first year up to the 30th of June, Mr. Jones said the bonus distributable among the sharers in the scheme was £360 15s. 2d.—being 5 per cent. on the wages of each man during the past year. Altogether, 113 employees had taken part in the scheme—47 from the office and 65 from the works. But what they most desired was that the employees should help themselves. As they might know, in saving money, the great difficulty often was to make a start. The profit-sharing scheme gave them all this start. It was now open to them, and to their wives, to do all they could to increase the amount of savings. He was glad to say that 26 had already begun on their own account; and personal savings and interest during the past few months amounted to about £231. They had made a very good beginning, therefore, with the saving scheme as well as with the bonus scheme; and the two together totalled to £591 16s. 1d. He hoped the scheme would result in greater common efforts for the good of the Company and all connected with it, particularly the employees, and also including the Company's customers. It was to be hoped their example might bear fruit in their own district—say in Cheltenham, Stroud, and Cirencester. The toast was very cordially honoured. Votes of thanks were then passed to the Committee and Secretary, and also to the Chairman, and this portion of the proceedings closed. An excellent entertainment, arranged by Mr. W. S. Morland, followed, and an enjoyable evening was spent.

SALFORD CORPORATION GAS DEPARTMENT.

The Past Year's Working.

We have received from the Gas Engineer and Manager of the Salford Corporation (Mr. W. W. Woodward) the report of the Gas Committee and an abstract of the accounts of the gas undertaking for the year ended the 31st of March last.

The report opens with an expression by the Committee of their pleasure in recording that the usual growth in the number of consumers was maintained during the year. The sales of gas, however, showed a decrease equal to 3·52 per cent., probably due to the general depression in trade. The demand for gas appliances generally was very satisfactory, and the business in cooking-stoves increased. The works and plant were maintained in a thoroughly efficient condition; and a new bench of inclined retorts was completed at the Albion Street works. The quantity of coal and cannel carbonized was 162,930 tons; and the make of gas was 1,656,195,000 cubic feet, of an average illuminating power equal to 18·96 candles; the parliamentary standard being 18 candles within and 17 candles beyond the borough. There was a considerable decrease in the revenue from residuals last year compared with the year 1907-8. The price of gas was reduced on July 1, 1908, by 3d. per 1000 cubic feet to all ordinary consumers; and the quantity supplied for 1d. to those taking their gas through prepayment meters was increased from 28 to 30 cubic feet.

The abstract of accounts appended to the report shows that a sum of £10,917 net was expended for capital purposes in the twelve months; the principal items being £4241 for buildings and plant, £2770 for mains and service-pipes, and £3282 for sundries. The revenue account shows that the sale of gas produced £176,922; the rental of stoves, £1896; residuals brought in £51,987; and the total receipts were £231,126. The expenditure on the manufacture of gas was £129,283 (coal costing £91,850, and repair and maintenance of plant £16,527); on distribution, £15,440; and on management, £7645. The total expenditure (including £419 written off for bad debts) for the year was £171,738; leaving £59,388 to go to the profit and loss account. The total of this account was £60,724; and it has been disposed of as follows: Interest on mortgages and deposits and annuity payable to the district fund, £22,784; redemption of loans, £16,392; depreciation, £1500; transferred to the district fund account, £20,048.

Acting upon instructions from the Worsley District Council, Mr. J. P. Monks, the Law Clerk, is in communication with the different authorities in the gas supply area of the Salford Corporation in regard to the best methods to be adopted for obtaining the concessions named when the gas clauses of the Bill of the Corporation were recently before the Committee of the House of Lords.

EXTENSIONS AT THE WINSFORD GAS-WORKS.

Local Government Board Inquiry.

Last Tuesday, Mr. R. H. Bicknell, M.Inst.C.E., held an inquiry at Winsford in regard to an application by the Urban District Council for sanction to the raising of £1800 for the extension of the gas-works.

It was explained by the Gas Engineer and Manager (Mr. F. Sidwell) that since 1901 the make of gas had increased from 14 to 29 million cubic feet per annum; and the net price had been reduced from 4s. 2d. to 3s. 3d. per 1000 cubic feet for ordinary consumers, and from 4s. 8d. to 3s. 4d. for the users of prepayment meters. When the gas-works were acquired by the Council, their minimum capacity was 10 million cubic feet, and the maximum 15 million cubic feet per annum. During the past year, the gas made amounted to practically 30 millions; for the plant was much too small. It was proposed to put in four purifiers, 12 feet by 15 feet and 5 feet deep, which would increase the manufacturing capacity to 60 million cubic feet; also a tower scrubber, a set of annular condensers, with a similar capacity, and a new oxide shed. It was also mentioned that when the make of gas reached 60 millions per annum, the storage room would also be increased. In answer to the Inspector, Mr. Sidwell admitted that the erection of the oxide shed has been started; but the Clerk explained that no contract had been prepared, and the tender had been accepted subject to the approval of the Local Government Board. There was no opposition.

With the exception of the oxide shed, the contract for the extension has, we learn, been placed with Messrs. R. Dempster and Sons, of Elland.

METROPOLITAN WATER BOARD.

Sixth Annual Report.

We have received from the Clerk to the Metropolitan Water Board (Mr. A. B. Pilling) a copy of the sixth annual report, dealing with the work of the Board in the year ended the 31st of March last.

The report opens with some explanatory remarks on the constitution of the Board, and then sets forth its financial position. On the 1st of April, the capital debt was as follows: Metropolitan Water "A" Stock £6,060,165, interest £181,805; Metropolitan Water "B" Stock £35,579,760, interest £1,067,393; redeemable debenture stocks, mortgages, &c. (including £1500 London Bridge annuities), £7,232,138, interest £221,161—total stock, £48,872,063; interest £1,470,359. The annual interest charge of £1,470,359 was equivalent to 4·3d. per 1000 gallons of water supplied. The District Auditor certified that the surplus upon the accounts for the year 1907-8, being the excess of income over expenditure on revenue account, was £933 9s. 8d., which sum was applicable to the special redemption fund for the discharge of stock in respect of which a period of 100 years is prescribed by the Metropolis Water Act, 1902. Sums of £18,544 2s. 1d. and £2056 12s. 5d. of the Board's "B" stock were purchased for extinction in July, 1908, and January, 1909, respectively. The total amount standing to the credit of the Board at the end of the year under review was £81,474 12s. 3d., of which amount £72,245 1s. 4d. had been invested; leaving a balance of £9229 10s. 11d. uninvested. There is a further sum of £21,243 remaining uninvested, set aside to March 31, 1908, in respect of expenditure in anticipation of permanent borrowings, to which has to be added a contribution in respect of the year ended March 31, 1909, the amount of which is approximately £10,000.

The Board have minimized as far as possible the continuance of the old practice of cutting off the water as a means of enforcing the payment of water-rates, by the substitution of legal proceedings. The percentage of the total amount collected to March 31 last was 88·36, compared with 91·37 for the half year to March, 1908, and 84·16 for the six months to Sept. 30, 1908. The high figure of 91·37 per cent. was obtained before the temporary disturbance caused by the coming into operation of the Board's Charges Act of 1907.

Turning to the portion of the report furnishing particulars of the sources of supply, we find they continue to be four—viz., the Thames and the Lea; gravel beds adjoining the main stream of the Thames and other gravel beds at Hanworth; natural springs; and wells sunk in the chalk or other strata in the Lea Valley, on the north of the Thames, in Kent, and at certain other points south of the Thames. The Thames furnished 57·27 per cent. of the Board's total supply, compared with 55·98 per cent. in the previous year. The daily average quantity gauged at Teddington was 983·7 million gallons—a decrease of 306·1 million gallons compared with 1907-8. The daily average total abstraction from the river was 134·7 million gallons. The daily average natural flow at Teddington was therefore 1118·4 million gallons during the year, compared with 1412 million gallons in 1907-8. The total volume abstracted from the river was 49,179·2 million gallons, or 4473·8 million gallons more than in the year 1907-8, though that year contained a day more. There was, compared with the previous year, an increased average daily abstraction from the river of 12·5 million gallons. Of the 134·7 million gallons daily average quantity abstracted by the Board and the Suburban Companies, the Board drew 132·3 million and the Companies 2·4 million gallons. The percentage of the river's natural flow abstracted by the Board was 11·83, and by the two Suburban Companies 0·21, or 12·04 per cent., compared with the total abstraction of 8·65 per cent. in the year 1907-8. There was an increase in the total quantity abstracted from the River Lea by the Board equal to an average daily increase of 10·76 per cent.

The total volume of water supplied during 1908-9 was 81,823·9 million gallons, compared with 80,170·9 million gallons in 1907-8—an increase of 1652·9 million gallons. The average daily supply was 224·2 million gallons; the figure for 1907-8 being 219 million gallons. The southern district took the largest proportion of the total supply—viz., 27·70 per cent.—and the Kent district the smallest, 8·87 per cent. The eastern district consumed 19·21 per cent. of the total supply; the New River district 19·33 per cent., and the western district 24·88 per cent. The total estimated population supplied by the Board at the close of the year—viz., 7,046,814—represented 15·7 per cent. of the population of Great Britain and Ireland. Within the County of London there was an estimated increase for the whole of the Metropolis of 18,930, or 0·4 per cent., compared with the previous year; and the total increase outside the county was 51,089, or 2·32 per cent. There was an increased supply of 0·39 gallon per head per day as compared with the preceding year; while the average population is estimated to have increased 1·08 per cent., and the average number of services 1·24 per cent. For the whole area, the average daily supply per head was 31·94 gallons. In 1907-8, the average daily supply per head amounted to 31·55 gallons; in 1906-7, 32·84 gallons; in 1905-6, 32·31 gallons; and in 1904-5, 33·54 gallons. The total number of services supplied at the end of the year was 1,088,501—an increase of 12,390 over the preceding year. The average daily supply per service was 206·9 gallons, compared with 204·68 gallons; and the average population supplied per service was 6·48, against 6·49 in 1907-8. The increase in the number of services on constant supply during the year was 15,776, or 1·5 per cent. The proportion of supplies on the constant system at the close of the year was 97·74 per cent.

In the section of the report dealing with the storage reservoirs, reference is made to the commencement on April 11, 1908, of the Chingford reservoir, the capacity of which is approximately 3000 million gallons, and on the 24th of the following October of the Island Barn reservoir at East Molesey, which will contain nearly 1000 million gallons. These works were designed by Mr. W. B. Bryan, the Chief Engineer of the Board. The effective amount of storage and subsidence reservoir capacity for unfiltered water possessed and in use by the Board at the end of the year was 8844·7 million gallons; no addition having been made during the year. The total storage in existence, in course of construction, and authorized but not commenced was 14,844·7 million gallons. The following figures show the increases which have taken place under the Board in the active equipment of water-works since the transfer of the undertakings:

	Before June, 1904.	At March 31, 1909.
Storage reservoirs for unfiltered water	57	62
Acreage of storage reservoirs	886	1497
Capacity of ditto in million gallons	4077·6	8913·6
Service reservoirs for filtered water	74	82
Capacity of ditto in million gallons	241·5	255·4
Filter-beds	137	166
Acreage of ditto	140	164

In the section of the report dealing with the miscellaneous work, reference is made to the various legal decisions given in the course of the twelve months. There were 2277 cases referred to the Solicitor for proceedings to be taken, and 1890 summonses were issued, which resulted in payment in 1065 instances. Other cases were partly paid, abandoned, or left outstanding. The important work of the Director of Water Examinations (Dr. A. C. Houston) is also dealt with. He reports that "there is no doubt that the habitual use of stored water lightens the grave responsibilities of the Board as regards the safety of the Metropolitan Water Supply, and tends to create a sense of security among those who watch over the health of the Metropolis." Other matters touched upon are Dr. Mills's rainfall records, the uniform scales of charges, &c. The total rateable value of the Board's properties (including the mains) is £1,185,436, distributed as follows: Bucks, £786; Essex, £82,476; Herts, £16,766; Kent, £31,780; London, £638,353; Middlesex, £281,346; Surrey, £133,929.

BOLTON WATER-WORKS EXTENSIONS.

Local Government Board Inquiry.

At the Town Hall, Bolton, a short time ago, an inquiry was held by Mr. P. M. Crosthwaite, M.Inst.C.E., and Dr. L. W. Darra Mair, in regard to an application made to the Local Government Board by the Bolton Corporation for sanction to the borrowing of £15,700 for works in connection with the Dingle and Heaton reservoirs.

The Town Clerk (Mr. S. Parker) opened the case, and he was followed by the Water-Works Engineer (Mr. Lewis Mitchell, Assoc.M.Inst.C.E.), who furnished the necessary technical details. The area of the water supply of the Corporation comprises 42,080 acres; the area served having approximately a population of 290,000. The average daily consumption is 6,670,000 gallons, which works out to 23 gallons per head per day; 15 gallons being used for domestic and 8 gallons for manufacturing purposes. Mr. Mitchell stated that the water drawn from the Heaton reservoir was not satisfactory; and if this reservoir was to be retained it would be absolutely necessary to re-filter the water as it left the reservoir, and deliver it direct for consumption. The results obtained from the mechanical filters at Sweetloves and elsewhere were such as to justify the hope that the suggested alterations would render the water wholesome and palatable. The proposed works in connection with the Dingle reservoir included a filter-bed with an area of 800 superficial yards; a covered pure-water tank with a capacity of 180,000 gallons; a chalk mixing apparatus and a house for it; and a turbine with pump and injector for applying soda-ash to the filtered water. This water was of a higher standard than that obtained from the other sources, and in its origin was pure and good. It possessed lead-dissolving properties, however, and in the report of the Local Government Board it was stated that "it is not unlikely that if the water be continuously dealt with in adequate and properly-constructed filter-beds the filtration process will ordinarily suffice to deprive it of lead-dissolving properties." It was proposed to construct an additional filter, so that at least two filters should always be at work; and a covered pure-water tank, with a capacity of 180,000 gallons, which would increase the storage capacity for filtered water to 230,000 gallons. By thus meeting the fluctuations in the draught on the mains, the filters would be enabled to work regularly, and give a uniformly high efficiency. The Water Committee had consulted Professor Harold B. Dixon and Professor Percy Frankland on the proposed scheme; and the opinions expressed by them were entirely favourable. Mr. Mitchell described the proposed works, the methods of filtration, &c.

WATER QUESTIONS AT THE LEEDS HEALTH CONGRESS.

During last month there was held in Leeds a Health Congress, promoted by the Corporation and University, with the co-operation of the Royal Sanitary Institute and the Royal Institute of Public Health. In the Engineering Section (the President of which was Mr. C. G. Henzell, the Water Engineer to the Corporation) various papers bearing upon water supply were read and discussed.

Mr. R. Ross read a paper prepared by himself and Mr. J. Race, on "The Mechanical Filtration of Water Supplies," in which comparisons were given of the results obtained by the use of certain mechanical filters working under identical conditions. The authors pointed out that there were comparatively few places where different systems of filtration were in use for the treatment of the same water supply. The experiments extended over a period of three months, and were, of course, too short to be treated otherwise than as preliminary. They did not propose to deal with the efficiency of mechanical filtration for the purification of highly polluted water supplies; but the experiments were carried out with typical moorland waters for the supply of Burnley. The gathering-ground was chiefly rough pasture, and the soil more or less peaty. The drainage area was 1000 acres, the average annual rainfall 41·5 inches, the capacity of the reservoir 250 million gallons, the maximum depth 61 feet, and the area of reserve 38 acres. Except along the embankment, the reservoir was not pitched; it contained a considerable amount of peaty soil, and there was no bye-pass for storm water. In consequence of the unsatisfactory state of the water, of which only a million gallons per day could be dealt with by the existing sand filters, and owing to lead poisoning occurring from time to time, the Burnley Corporation decided that it was necessary to increase the means of filtration very considerably; and in the end they adopted Bell's and Mather and Platt's filters. Before the introduction of the mechanical filters, the water, which was almost invariably acid, was treated with lime at the rate of 120 lbs. per million gallons. More lime could not be used without any tendency to clog the filter-beds; and the amount taken up by the water was not always sufficient to overcome its plumbo-solvency. When mechanical filters were first used, lime was also employed; but it was not found satisfactory owing to its extremely limited solubility. It was then deemed advisable to use carbonate of soda as a neutralizer, together with a small quantity of aluminium sulphate as a precipitant. During the first two months' working, 120 lbs. of carbonate of soda per million gallons were used without sulphate of alumina. Samples were taken after standing all night in a long line of lead pipe situated in the town; and at the end of about a week's treatment no trace of lead could be found even in the first runnings. From the 2nd of June, sulphate of alumina was added at the rate of 1-10th of a grain per gallon, and the carbonate of soda was reduced to 80 lbs. per day, as the acidity of the water in summer time showed a considerable decrease. Further samples taken in the town subsequent to the alteration had not shown any traces of plumbo-solvent action. The conclusions of the authors were that for certain classes of water mechanical filtration was sufficiently efficacious and far less expensive, both as regarded installation and working expenses, than sand filtration. Considering the results as a whole, there seemed to be little doubt that, if used under proper control, mechanical filters could be made to produce an effluent to all intents and purposes equal to that obtained from sand filters.

Mr. H. C. H. Shenton discussed the question of "The Sterilization of Water." He said this operation had been carried out satisfactorily in this country by the addition of chemical hypochlorite in very small quantities. This had been done more often than was generally known, as it was carried out unostentatiously where the water was found to be polluted, and the safety of the consumers had to be ensured promptly. At the present time the three practical methods in use were: (1) Ozone sterilization, as adopted by the Paris Municipality, at Nice, at Philadelphia, and at a great many other places of magnitude and importance abroad. (2) The chemical chlorine process, as applied to the Lincoln water during the epidemic, and in use elsewhere at the present time. (3) The electrolytic hypochlorite process, whereby a sterilizing agent of greater efficiency than chemical hypochlorite was produced by passing a current of electricity through salt and water, this agent being then applied to the water in very small quantities. This sterilizing agent was produced and used in large quantities for various disinfecting purposes with excellent results; but so far, in spite of its obvious economical advantages, it did not appear to have received the attention it deserved for the purification of water. At present there had been no exact comparative experiments made of the relative cost of these three methods, and it was greatly to be desired that such experiments should be made. One of the most important features of water sterilization was the enormous saving of expense to be effected by dispensing with filters and storage reservoirs used for purification purposes.

Dr. Samuel Rideal next dealt with the "Chlorine Sterilization of Polluted Waters." He said that an objection to the use of oxidizing agents for sterilization had always been the waste occasioned through their consumption by otherwise inert and harmless organic and inorganic matters. But with chlorine and hypochlorites the first rapid consumption was succeeded by slower action, which continued for some hours, and even days, attended by a germicidal power after free chlorine or hypochlorite had disappeared, due to the substitution products of the action of chlorine on ammonia and organic nitrogenous matters. Therefore it was found that ammonia and many nitrogenous substances, instead of diminishing the bactericidal power of chlorine and hypochlorites, actually increased it; thus securing great economy in the treatment of sewage and polluted waters. He said he had found that most polluted drinking waters could be sterilized by sodium hypochlorite in the proportion of one per million of available chlorine, and that after standing for about two hours no smell or taste of the reagent was perceptible. Therefore no subsequent filtration or other treatment was necessary.

Dr. A. C. Houston, the Director of Water Examination to the Metropolitan Water Board, sent a communication, on "Stored Waters," which was read in his absence by Mr. A. J. Martin. He said that filtration, after all, was either a purely mechanical or a bio-mechanical process, and must needs be fairly rapid to be adopted in practice. Storage, on the other hand, if sufficiently prolonged, not only reduced the number of microbes by sedimentation and by slow processes of natural destruction, but seemingly also brought about what might be termed a selective bacterial death-rate. It was by no means unlikely that a specifically polluted water might, if stored for a sufficient length of time, become quite harmless, owing either to total extinction of pathogenic bacteria, or to what practically came to the same thing—viz., loss by such bacteria of their specific properties. His conclusions were that storage reduced the number of bacteria of all sorts, reduced the amount of suspended matter, had a marked levelling effect on the totality of water delivered to the filter-beds, and tended generally to lengthen the life of the filters. He expressed the opinion that the use of stored water went far to wipe out the gravity of the charge that the chief sources of the water used in London were sewage polluted rivers, it rendered any accidental breakdown in the filtering arrangements much less serious than might otherwise be the case, and it lightened the grave responsibilities of the Water Board as to the safety of the London Water Supply.

The papers were discussed together.

Mr. J. Parker, the City Surveyor of Hereford, said the paper on "Mechanical Filtration" was most interesting to those who had to deal with the water supplies of cities, and were faced with the increasing demand for filters or for improved purity of the water. He had to deal with water pumped from the Wye, which certainly for a great portion of the year was quite pure. Occasionally, however, they had floods which made the water in the river the colour of cocoa. The works were on the top of a hill, and it was exceedingly difficult to increase the accommodation; and some years ago they had to resort to mechanical filters. These had worked very well, though the Medical Officer of Health was rather in favour of sand filters.

Dr. J. W. Miller, the gentleman referred to by the previous speaker, said that at times river water became murky, and it was useful in this connection to have mechanical filters which would remove the grosser particles, and so prevent the sand filters from becoming clogged. He thought, however, that reliance must be placed on sand filtration to remove bacteria, and that no chemical methods should be substituted for bacteriological methods of filtration.

Mr. T. Fairley (Leeds) said the water supply of York had been subject, under his direction, to bacteriological examination for some years past. The crude water from the Ouse, which received the sewage of a number of towns, might contain a variable number of bacteria—perhaps averaging 15,000 per cubic centimetre. The number was very considerably reduced in the subsiding reservoirs in which the water was stored; and afterwards, by sand filtration, they brought it down to what he called a negligible quantity. His experience, which was begun probably before Dr. Houston commenced his experiments, was satisfactory as tending to confirm his conclusions.

Mr. A. J. Price (Lytham) enquired whether, instead of storing the water, it would not be possible to bring about the same results at much lower cost by preliminary filtration. When he was at Worcester, the question arose of taking water during flood time; but the late Mr. Mansergh advised them to construct reservoirs to provide sufficient storage for three weeks' supply. This would have cost £20,000, whereas filters could have been installed for one-third of the cost. When Professor Dewar and Sir William Crookes gave evidence before the Royal Commission on the Metropolitan Water Supply, they expressed the view that there was no harm in taking water during flood time, if there was mechanical straining. He should like to know what that experience was at the present time.

Mr. W. Whitaker, F.R.S., said the papers showed the difficulty of hard-and-fast rules being applied in all cases, for they must be prepared for local variations. He was glad to hear from Dr. Rideal that chemists did not agree on these matters, for if they did they would override water engineers. Mr. Parker had said his river was pure; but he must have meant comparatively pure. If they were dealing with river water, they must do something to purify it; and it was the excellent purification work done in London that enabled the Water Board to supply really good water. It was satisfactory to know that by various processes water could be sterilized; but there was another method of avoiding polluted waters which should be resorted to whereever possible, and that was to get a supply which was not polluted.

Mr. Race, replying to the remarks made on the paper by Mr. Ross and himself, said that by the addition of suitable precipitants equally good results could be obtained by mechanical filters as with sand filters. Indeed, sometimes they were better. The Bolton results showed that both bacteriologically and chemically the effluent from the mechanical filters was distinctly superior to that from the sand filters, as with the latter the rate of filtration must be in proportion to the purification desired. The cost of mechanical filtration, even with the use of 2·3 grains of sulphate of alumina per gallon, was less, when interest, sinking fund, and maintenance were taken into account, than that of ordinary sand filtration. Mr. Shenton, replying on his paper, submitted that there was abundant evidence that sand filtration alone could not be relied upon for the removal of disease germs. Dr. Rideal said the City Engineer of Hereford would find some difficulty in increasing his storage capacity on the top of a hill, and suggested that he should look into the chlorine process.

Dr. C. J. Russell M'Lean next read a paper on the value of water analysis. His conclusions, based on experience in rural and small urban districts, were to the effect that present-day standards of analysis were unreliable as guides to wholesomeness of drinking water.

Mr. T. Fairley (Leeds), in the course of a paper on "The Water Supplies of Yorkshire," said the softest waters up to 7 grains of dissolved solids per gallon were generally found in the uplands west and north-west. Leeds, Bradford, Sheffield, Harrogate, Huddersfield, &c., had supplies comparable with those of Glasgow and Manchester. They were improved by storage and by filtration; and with due care they were safe for all domestic and manufacturing purposes. So far as he was aware, the use of a trace of copper salt to facilitate the separation of algæ and bacteria had not been tried in Yorkshire. The underground waters of the county varied exceedingly—depending on the nature of the strata and the depth from which they rose. The total dissolved solids ranged in amount from 7 to over 100 grains per gallon; and in their composition varied more widely than elsewhere in the country, or perhaps in Europe. The river waters were all more or less mixtures of ground and surface waters. As to future increased water

supplies, the available gathering grounds were being rapidly taken possession of, and future extensions must be met mainly by a more careful control of existing supplies.

Mr. C. Clemesha Smith, M.Inst.C.E., the Water Engineer to the Wakefield Corporation, described the methods adopted to prevent plumbo-solvency in his district of Wakefield. The source from which the water is derived is peat-covered moorland; hence the acidity of the water. Treatment by adding carbonate of soda was adopted as a temporary measure in 1892; and the author described the method and the cost of treatment. On the adoption of filtration in 1898, the question of the effect of sand filtration on the plumbo-solvent action of the water was considered, and many experiments were made with different sands. They showed that where filtration removed the affinity for lead when the sand was new, such action gradually decreased, and eventually the treatment must be combined with filtration. The use of limestone as an underlayer was proved experimentally to be of little value; while the use of lime or chalk, together with soda, was found to be detrimental. Treatment with lime and chalk before filtration was found, experimentally and on a large scale, to be insufficient; the water losing some of its alkalinity in passing through the filter-beds. It was decided to add chalk prior to filtration, and lime water after filtration. The chalk and lime treatment had been found quite as efficient as the soda treatment as regards the prevention of plumbo-solvency; it was also less costly, and did not give the water the "flat" taste which accompanies the soda treatment.

The Chairman said the papers they had heard covered a great deal of ground. In Leeds they had careful analyses, both chemical and bacteriological, of the water; but the city was rather well off in the quality of its supply. Some years ago, the question of mechanical filters was considered. They were troubled with algæ, and he wondered whether mechanical filtration might take it away, but believed it to be impossible. He had only recently begun to study the question of sterilization; but, from what he had read and heard, he was inclined to think that there was a great future for it. They found in Leeds, as Dr. Houston did in London, that water improved by storage.

QUALITY OF TRURO WATER.

A considerable portion of the address of the Chairman (Mr. A. C. Willyams), when moving the adoption of the report of the Directors at the recent half-yearly meeting of the Truro Water Company, was on the subject of the quality of the water supply of the town. In the course of the report, it was mentioned that during the spring a somewhat unsatisfactory analysis of the water was made, and it was thought advisable to caution consumers for a time to boil it before drinking it. But this caution had been withdrawn, in consequence of a favourable report having been received from Dr. J. C. Thresh. With the consent of owners of property adjoining the stream, the Directors had carried out improvements which they had every reason to believe would prevent pollution in future; and they had arranged to have an analysis of the water made quarterly for the present. The Chairman explained that there were upwards of 40 hydrants, the property of the City Council, which were of an old description, and which were not really dependable. The Company had several times called upon the city authorities to replace these hydrants by more modern ones. Some of the latter had been tried, and had worked out satisfactorily; but so long as the 40 to which he had referred remained, they would not be safe from the fear of contamination. They had put this as strongly as they could before the Council, but nothing further had been done. This was very unsatisfactory, because in a case of this sort, where there was the least trace of contamination, they should do their utmost to find the cause and remedy it as soon as possible. It was the duty of the Council, as it was the Company's duty, to remove all possibility of infiltration of impurities into their mains. They had had an analysis made as recently as the 18th of June by Dr. Thresh, who stated that the water was of satisfactory bacteriological quality; and in consequence of this analysis the Company withdrew the notice issued to consumers, at the request of the Council, to boil the water. He thought they would say they were justified in doing so.

The subject was discussed at some length at the meeting of the Council last Tuesday, on a recommendation by the Sanitary Committee, based on a report by the Surveyor, that the existing ball hydrants (numbering about 40) in the city should be replaced by spindle hydrants at the rate of 12 per annum. Mr. Jacob inquired if the ball hydrants had been condemned by the Surveyor or by any official other than the Engineer of the Water Company. The Surveyor said he thought they constituted a possible source of danger, but not to the extent that had been represented. Mr. Tonkyn proposed that the whole of the hydrants should be changed. Mr. Lodge seconded the proposition; and it was carried by 13 votes to 5. The Committee were afterwards instructed to obtain prices.

WATER SUPPLY IN SPAIN.

A Ten Years' Drought.

The report presented at the annual meeting of the Seville Water-Works Company, Limited, stated that the income in the year ending March last amounted to £37,218. After deducting working expenses, the cost of laying on services, and the service of debentures, the net profit for the year was £4708, compared with £5968 in the previous year. Adding the unappropriated profit at March 31, 1908—£13,422—the amount standing to the credit of profit and loss account was £18,130. The Directors recommended that a dividend of 2 per cent. be paid on the share capital (absorbing £5422), that £2582 be transferred to reserve (making it £5000), and that the balance of £10,125 be carried forward. The Directors regretted that the scheme referred to in their last report for supplementing the potable supply of Seville by filtered water from the River Guadalquivir had had to be withdrawn, owing to public opposition. The Water Commission having, however, now recognized that no more water could be obtained from the Guadaira Basin, it was hoped that negotiations would result in a solution of the difficulty.

The adoption of the report was moved by the Chairman (Mr. Cowley Lambert), who said the net profit for the year was some £1260 less than it was for the preceding year. This decrease was due to an increased expenditure, and not to a falling off in the water-rentals, which were actually a little more than the year before. Among the items to which he particularly referred was the one "expenses in connection with additional supply during drought," in which there was an increase of 17,798 pesetas. This was made up of an increase of 9000 pesetas for water taken by the Company from Santa Lucia, covering a period of six-and-a-half months; whereas the amount in the previous year, for the same purpose, only covered a period of three months. This made a great difference. A further amount of 5758 pesetas was for improved gas plant for the pumping-station at Las Aceñas. Then with regard to the expense in connection with the river water project, this was an item which had been rendered necessary by the endeavours to find a solution of the problem for a further water supply; and this covered the cost of negotiations in various directions carried on throughout the year. The Directors were very pleased to have Mr. Bithell, the Company's Engineer and Manager, present at the meeting. He was sure the shareholders would all agree with him (the Chairman) in congratulating Mr. Bithell upon having, in so short a time, formed and gained the goodwill and confidence of the authorities in Seville, though he had not yet been able to induce them to seek the advantage of a constant supply of filtered potable water from the river. His interviews and negotiations with the authorities had been carried out in the greatest friendliness and goodwill; and it was hoped the position he had already gained for himself in Seville would enable him ultimately to solve the problem of the water supply.

The motion was seconded by Mr. F. S. Jackson. There was a short discussion; and the Chairman, replying to a shareholder, stated that the drought in Spain had continued for ten years, and that it was getting worse and worse. If, however, the people of Seville would only be reasonable, and see with the Directors that the city could be supplied from the river with just as good water as London, Paris, or Antwerp, they could have all the water they wanted.

The resolution was carried; and the dividend recommended was declared on the motion of the Chairman, seconded by Mr. Easton Devonshire.

Other formal business followed; and, later, replying to a vote of thanks, Mr. Bithell remarked that there was a good future for the Company when he could get the filtered water business settled, as he hoped to do. Filtration, however, was not understood in Seville. It was difficult to convey to the people's minds that it was possible to filter dirty water, and make it pure and drinkable. However, he was hopeful that all opposition would die away. At the present time, the wells yielded only some 300 metres per hour; while the service required about 11,000 metres per hour.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In the Hamilton Town Council on Tuesday, the Gas Committee reported, with reference to the burgh Provisional Order, that objection had been taken by the Scotch Office to clause 11, which dealt with the appropriation of lands for gas purposes, and also to clause 19, in regard to the providing of fittings; and that the Town Clerk had explained that the Scotch Office were to submit a clause dealing with the profits of the gas-works, with a view to an annual contribution towards the rates. The Committee, while favourably inclined to the principle of applying a portion of the gas-works profits towards the reduction of the rates, were opposed to any statutory obligation being placed on the gas-works. With regard to clause 19, the Committee were of opinion that it should be dropped if the contractor's clause were insisted upon. The Town Clerk was instructed to report the views of the Gas Committee to the Committee in charge of the Order. The forecast of the Manager—Mr. J. Ballantyne—of profits for the current year showed a gross profit of £6101, as compared with £5049 last year. If the price of gas were reduced by 2½d. all over, he estimated that the above profit would be reduced by about £1000. The Committee recommended that the price be reduced by 2½d. per 1000 cubic feet—the rates to be 1s. 10½d. to ordinary consumers and 1s. 8d. for street lighting and power purposes, the reduction to take effect from the next survey. They also recommended that the price of gas supplied through prepayment meters should be reduced by 2½d. per 1000 cubic feet, and that the Manager should arrange, in lieu of altering the meters, to refund money when the collection was made. The Committee recommended that the capital cost of the coal-handling plant and the railway siding be carried forward as a floating debt, and be paid off by annual instalments of not less than £1000. The Committee were unanimous in recommending that the Manager's salary be increased by £20 a year; and that the Assistant-Manager's wages be increased to £3 5s. per week. After discussion, the increase to the Manager was granted; only two members of the Council voting against it. The other portions of the Gas Committee's report were also adopted. Hamilton now possesses the distinction of selling gas at a lower price than is charged anywhere else in Scotland. The gas is of 18-candle power. In Glasgow, where the gas is also of this power, and in Coatbridge, where it is over 20 candles, the price is 2s. per 1000 cubic feet. These are the lowest prices in Scotland.

It will be observed from the account of the proceedings at Westminster that the Coatbridge Gas Company have obtained their Provisional Order, notwithstanding the opposition of the Town Council. The opposition was almost hopeless; being little more than a policy of despair at the prosperity of the Gas Company. It might have been expected that the Corporation, considering the enormous benefit which the community have received at the hands of the Company, in the low price which they have charged for gas—for some years the cheapest in Scotland—would have had confidence in the Company, and have

relied upon their serving the town in the same reasonable spirit as heretofore; but a spirit of avarice seems to have possessed the Corporation, to the extent of their putting forward the claim that if the Company were to be allowed to supply gas which would cost less to produce, the community should benefit and not the Company. This view was not listened to by the House of Commons Committee, any more than it was by the Committee of the House of Lords. The other plea of the Corporation, that a calorific test of the gas should be imposed, is a somewhat puzzling one. Who suggested to the Corporation of Coatbridge that this test should be required of the Gas Company of so comparatively small a town? It is highly improbable that the idea originated in Coatbridge. It would rather appear to have been an exotic suggestion. It may have been an emanation from the Scotch Office, in which the guiding principle seems to be that their function is not to assist, but to harass, the promoters of local undertakings; or it may have been the suggestion of some consulted engineer who has advanced views on the matter of testing for calorific power. Whoever was the author of the proposal, he has failed; the Legislative tribunal having refused to impose, in the case of a small gas undertaking, a condition which has not yet been placed upon larger undertakings. The Company, which is one of the best managed concerns in the kingdom, have got their Order, with one or two trifling ameliorations; and there can be no doubt that, notwithstanding the views represented by the opposition, the Company will be found in practice to be as much alive as they have always been to the necessity for considering the welfare of the community, and that the community will not suffer, but, on the contrary, will benefit, by the new powers which the Company have obtained.

Some time ago, the villagers of Methven applied to the Perth Town Council for a supply of gas, and the Council remitted to their Gas Engineer—Mr. W. B. M'Lusky—to prepare a report on the subject. Mr. M'Lusky has reported that the laying of the main and the supplying of the gas present no difficulty—that, indeed, the situation is ideal from the gas supplier's point of view; and that, as the supply would be compressed at the holder station, a relatively small pipe would be sufficient, not only for Methven and district, but would also be available for compensating the Perth supply in the northern district, and for high-pressure supplies to factories for power or for intensified lighting. The whole cost of the work would not exceed £3500, and the fixed charge on this, for interest and sinking fund, would be £210 per annum. The sale of gas at Methven (which at present is less than half-a-million cubic feet per annum), at 4s. 3d. per 1000 cubic feet (the statutory increase of 4d. per mile on the Perth price), would bring out a deficiency. But with Almondbank, Ruthvenfield, and Pitcairnfield included, there should be a growing demand for gas in the district; and provided the sale amounted to 3,150,000 cubic feet per annum, the undertaking would pay. It was a scheme, however, which required further consideration; and Mr. M'Lusky suggested that the matter be delayed, and a canvass of the whole district carried out. The Gas Committee have agreed to delay consideration of the subject.

In the Newport (Fife) Town Council on Monday, Mr. Leitch, the Convener of the Finance Committee, reported that there was a surplus of £404 on the operation of the gas-works for the past year. The works, he said, were well managed, and an asset to the burgh, reflecting credit on the Manager (Mr. John F. Black) and the Convener. The price of gas had been reduced since the transfer from 5s. 5d. to 3s. 10d. per 1000 feet; and he thought there was a likelihood of a further reduction.

In the Wishaw Town Council on Tuesday, the Gas Committee reported upon the offers they had received for new plant for the gas-works. They recommended acceptance of the tender of Messrs. Parkinson and W. & B. Cowan, Limited, of Edinburgh, to fit up two 10-inch retort-house governors, for the sum of £139 13s. 6d.; and the tenders of Messrs. R. Dempster and Sons, Limited, of Elland, to erect a Livesey washer for £125, and a set of 12-inch pipe condensers, capable of passing 500,000 cubic feet of gas per day, for £264. The recommendations were adopted.

The Helensburgh Town Council on Tuesday had before them a report by the Gas Committee upon the improvement and reconstruction of the carbonizing plant and other extensions at the gas-works. After discussion, instructions were given for the preparation of specifications and the procuring of estimates as to the cost of the works, which, it is expected, will be about £12,000.

The Lighting Committee of the Lochgelly Town Council reported on Thursday that 18 new street-lamps had been erected. With regard to the offer by the Gas Company to supply light at the rate of 24s. per lamp per annum, it had been resolved to ask the Company to reconsider their offer. This was agreed to.

For the purpose of considering the question of public lighting, a meeting was held at Sandbank on Monday evening; and at it a Committee submitted a scheme in which provision is made for the erection of 32 acetylene gas-lamps of 50-candle power each. The initial cost was estimated at £130, and the annual cost at £52—equal to a rate of a penny in the pound. The meeting adopted the scheme; and resolved to ask the County Council to have a special lighting district formed.

Gas Poisoning at Newcastle-under-Lyme.—The mystery surrounding the death from gas poisoning of Elizabeth Botham at Newcastle-under-Lyme, on the 3rd inst., as noticed in the "JOURNAL" last Tuesday, was not solved at the inquest. The Jury found that death was due to poisoning by gas escaping from a gas-pipe, but that there was not sufficient evidence to show by whom the pipe was broken. Deceased's daughter said the woman had been more or less continuously drunk for four or five days. The gas-pipe leading from the main was hacked through close to the prepayment meter, and the money receptacle was also battered and the lock partly forced. The husband's brother, now on bail on suspicion of causing the woman's death, said the deceased hammered the meter with a hatchet on the night of Monday the 2nd inst., and the husband took the hatchet from her. The latter, who had to be removed to the Workhouse Infirmary, and was still dazed and ill, said his mind was a blank as to the occurrences of Monday evening and Tuesday morning. His opinion was that the deceased severed the pipe on Tuesday morning; but he did not know why.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 14.

Sulphate of Ammonia.

Notwithstanding the very heavy shipments in July, the market has been quiet, and parcels offered for tender have for the most part been disposed of at a slight decline on last week's prices. The closing quotations are, consequently, £11 per ton f.o.b. Hull, £11 2s. 6d. per ton f.o.b. Liverpool, and £11 5s. per ton f.o.b. Leith. Sales are reported to have been made abroad speculatively, at near the parity of spot prices, for delivery up to the end of the year, and even up to the spring months. Makers, however, though disposed to make concessions on recent quotations, are not willing to accept prices obtainable; so that the amount of first-hand business for delivery ahead has been in very limited compass.

Nitrate of Soda.

This article is again easier; the closing prices being 9s. 6d. per cwt. for 95 per cent., and 9s. 9d. for refined quality.

LONDON, *Aug.* 16.

Tar Products.

Markets have been quiet throughout the past week, but prices are fairly well maintained. Pitch has been very firm indeed, though not much business has been done, as makers decline to sell at anything like the equivalent of the prices at which buyers on the Continent are willing to pay. In South Wales, the consumers are holding off the market; being fully bought to the end of September or October next. Creosote is quiet; and there is little or no business doing in this article. Some of the manufacturers who have had occasion to sell have had to take rather low prices for their stock. Benzol 90 per cent. is quiet, and business has been done in the North at $5\frac{3}{4}$d., prompt delivery; while in London it is possible to buy at $6\frac{1}{2}$d. Fifty-ninety per cent. benzol is also easy. Business is reported in the North at $6\frac{1}{2}$d., and in London at 7d. Toluol is steady, but there is not much offering. Solvent naphtha is quiet in the North; but in London it is in fair demand. Carbolic acid is very weak, and business has been freely done at $10\frac{3}{4}$d. on the east coast.

The average values during the week were: Tar, 16s. to 20s., *ex* works. Pitch, London, 29s. 3d. to 29s. 9d.; east coast, 29s. to 29s. 6d.; west coast, 28s. 6d. to 29s. 6d. f.a.s. Mersey ports, 28s. 3d. to 28s. 9d. others. Benzol, 90 per cent., casks included, London, $6\frac{1}{2}$d. to $6\frac{3}{4}$d.; North, $5\frac{3}{4}$d.; 50-90 per cent., casks included, London, 7d. to $7\frac{1}{4}$d.; North, $6\frac{3}{4}$d. to 7d. Toluol, casks included, London, $8\frac{1}{4}$d. to $8\frac{1}{2}$d.; North, $7\frac{3}{4}$d. to 8d. Crude naphtha, in bulk, London, $3\frac{1}{4}$d. to $3\frac{1}{2}$d.; North, 3d. to $3\frac{1}{8}$d.; solvent naphtha, casks included, London, $10\frac{3}{4}$d. to 11d.; North, $9\frac{3}{4}$d. to 10d.; heavy naphtha, casks included, London, $10\frac{1}{2}$d. to $10\frac{3}{4}$d.; North, $9\frac{1}{2}$d. to $9\frac{3}{4}$d. Creosote, in bulk, London, $2\frac{3}{4}$d. to $2\frac{13}{16}$d.; North, $2\frac{3}{8}$d. to $2\frac{5}{8}$d. Heavy oils, in bulk, $2\frac{7}{8}$d. to $2\frac{15}{16}$d. Carbolic acid, 60 per cent., casks included, east coast, $10\frac{1}{2}$d. to $10\frac{3}{4}$d.; west coast, $10\frac{1}{4}$d. to $10\frac{1}{2}$d. Naphthalene, £4 10s. to £8 10s.; salts, 35s. to 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, $1\frac{1}{2}$d. to $1\frac{3}{4}$d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been quiet throughout the past week. The Gas Companies still maintain their prices at £11 7s. 6d. It is possible, however, to buy outside makes on Beckton terms at £10 18s. 9d. to £11; while the same figure is ruling in Hull. In Liverpool, business is reported at £11 1s. 3d. to £11 2s. 6d.; and in Leith £11 5s. to £11 6s. 3d. is asked, but business is difficult at this figure.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a return to more normal production of steam coals in the North, and with that the range of prices has been lowered; but some other kinds of coal keep scarce and firm. Best Northumbrian steams are from about 12s. to 12s. 3d. per ton f.o.b., second-class steams are 10s. 6d., and steam smalls are now more plentiful at from 5s. to 6s. 3d. In the gas coal trade, some sectional strikes have kept the supply rather limited, and thus have maintained the values. Durham gas coals of the usual kinds have been quoted, according to quality, from about 10s. to 11s. 3d. per ton f.o.b.; and for "Wear specials" up to 11s. 9d. has been the current price. A contract has been allotted to Durham collieries for some 16,000 tons of good gas coal, for delivery over twelve months, and the prices are much the same as those that are now currently quoted. There does not seem, therefore, to be much alteration expected soon in the price of gas coals, though there should be a more pressing demand as the autumn goes on. Coke is steady; and gas coke maintains its price, though a little more plentiful, at from 12s. 9d. to 13s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Trade is in a depressed condition, on account of the large stocks held by manufacturers. Orders are scarce; and in many instances the miners are getting longer holidays than usual. It will take some time before the effects of the threatened strike disappear. The prices quoted are: Ell 9s. 6d. to 10s. 6d., splint 10s. 9d. to 11s., and steam 9s. 6d. to 9s. 9d. per ton f.o.b. Glasgow. The shipments for the week amounted to 303,606 tons—an increase of 90,580 tons upon the previous week, but a decrease of 39,892 tons upon the corresponding week of last year. For the year to date, the total shipments have been 8,780,513 tons—an increase of 530,592 tons upon the corresponding period.

Effect of the Coal Mines (Eight Hours) Act.—It is reported that the export returns of the coal trade disclose a rather disquieting sequel to the coming into operation of the Mines (Eight Hours) Act. The foreign shipments of coal from Cardiff, Newport, Swansea, and Port Talbot in July totalled about 1,985,000 tons—a decrease of nearly 360,000 tons compared with July last year. To this must be added fully 150,000 tons decrease in coastwise trade and bunker shipments.

West's Coke-Conveyors, &c.

During the last month or two several large contracts have been placed with West's Gas Improvement Company, for installations of coke conveying and storing plants. They have in hand a contract for equipping the new inclined retort-house at the Gaythorn Gas-Works, Manchester, with a conveyor which will deliver the coke into skips to be handled by an existing coke-storage plant. The West coke-conveyor has already been in operation in an adjacent retort-house for a number of years. They have also a large contract in hand for a coke-conveyor and coke-storage scheme for the reconstructed retort-house at the Croydon Gas-Works, and have also contracts in hand for coke-convevors for the Sundby Gas-Works, Copenhagen, and the Turin Gas-Works. They are also supplying their coke-conveyor for conveying ashes at the electricity station at Amsterdam. In addition to these contracts, they have also contracts in hand for extensive schemes of coal-conveying machinery, including gravity-bucket conveyors for the Burnley Gas-Works, and the Formby power station of the Lancashire and Yorkshire Railway.

Theft from Gas-Meters at Rotherham.

At the Rotherham Police Court last Tuesday, George Roberts (21) was charged with stealing four sums of money from prepayment gas-meters belonging to the Corporation. The accused was one of a number of thieves who have given much trouble lately. Mr. P. E. Cooper, Solicitor, from the office of the Town Clerk, prosecuted, and said that in the present year, up to the 31st of July, there had been 94 meters broken into, money amounting to £12 abstracted, and damage to the extent of £3 10s. done to the meters. Most of the robberies had taken place from empty houses. Great difficulty had been experienced in bringing home the offences to the persons who had committed them; and he asked the Bench to impose the heaviest penalty on the prisoner, so that it would act as a deterrent to others. Several witnesses were called who had identified the prisoner. The detective sergeant who arrested Roberts said he found in his possession a skeleton key, an ordinary door key, a bunch of keys, a small box containing cuttings from newspapers, and a list of empty houses in the borough. Prisoner said he was very sorry, and made a promise to refund the money. The Chief Constable said Roberts had a very bad character, and referred to convictions against him for theft and other offences. Mr. C. B. Clark, the presiding Magistrate, described the charge as one of the most serious ever brought before the Court. Prisoner, a young man, seemed to have made up his mind to live by stealing from gas-meters. He had only a short time previously come out of prison after serving six months; and it appeared as if no lesson would ever do him any good. He was sentenced to two months' imprisonment on each charge, or a total of eight months.

Bankruptcy of Mr. Charles Scott-Snell.

In the London Bankruptcy Court on Monday last week, a meeting of creditors was held before Mr. W. Boyle, Official Receiver, under a receiving order made against Charles Scott-Snell, of No. 25, Victoria Street, Westminster. The accounts showed liabilities £13,588, of which £8588 is unsecured, and assets a doubtful book debt of £75. The debtor stated that prior to 1895 he was engaged on various electrical and incandescent gas matters. In 1899 or 1900 he invented a gas-lamp, and sold the patent to the Scott-Snell Gas-Lamp Company, Limited, with a nominal capital of £1,000,000. As vendor he received £259,000 in shares and £4000 in cash, and was appointed Director at a remuneration of £500 a year. Owing to insufficient working capital, the Company was wound up three years later, and the assets did not realize sufficient to meet the claims of the debenture holders. Since then he had invented a steam-boiler, a vacuum gas-compressor, and an apparatus for public amusement in the shape of a patent captive aëroplane. He sold the last-named invention to a company; but it appeared that it had been anticipated, and the share consideration he received was valueless. When he was a Director of the Gas-Lamp Company, and worth £50,000, he bought an estate at Wimbledon for £8000; the money being advanced by the bank on the security of his shares in the Company and a mortgage on the freehold. Owing to depreciation in the value of the shares and property, the bank were now unsecured creditors for £3000. The debtor attributed his present position to the failure of the Gas-Lamp Company. The case was left in the hands of the Official Receiver.

Gas Supply at Marseilles.—According to the report presented to the shareholders of the Marseilles Gas and Electricity Company at their last meeting, the quantity of gas sold in the past financial year amounted to about 1201⅝ million cubic feet; representing an increase of 13·17 per cent. compared with the previous year. The number of consumers was 9383, against 6895 in 1907, 5840 in 1906, and 2890 in 1905. The greater numbers were due to a reduction in the price of gas, which encouraged its use for heating and culinary purposes. The net profit, however, was about 1d. per 1000 cubic feet less last year than in the preceding twelve months. The total net profits amounted to 587,942 frs. (£23,518).

Buenos Ayres Gas Amalgamation.—With further reference to this matter, alluded to last week (p. 395), the "Financial News" states that an official circular will shortly be issued to the shareholders of the three Argentine Gas Companies, explaining to them the terms of the proposed amalgamation. The full details of the scheme will be published as soon as possible after the arrival in London of various official documents which are now on their way from Buenos Ayres. Meanwhile, the terms may be stated as follows in relation to the present capital of the Companies: In the case of the Buenos Ayres (New) Gas Company, it consists of £700,000 in ordinary shares and £250,000 in 4 per cent. debentures; and the Company will receive £500,000 in the Primitiva Company's 5 per cent. preference shares and £250,000 in ordinary shares. The River Plate Company's present capital is £1,500,000 ordinary, of which £1,000,000 has been issued; and there are £312,500 of debentures. The Company will receive £1,000,000 in preference and £500,000 in ordinary shares of the Primitiva Company.

Gainsborough Gas Undertaking.

The accounts of the Gas Department of the Gainsborough District Council for the year ended the 31st of March last, which were presented by the Chairman of the Gas Committee (Mr. W. Drust, J.P.) at the meeting of the Council on Monday last week, showed a gross profit of £5080, and a net profit of £118. During the year, nearly £1000—a very heavy item—had been spent on the renewal of mains and services. The conversion of the street-lamps from the flat-flame to the incandescent system was completed during the year; and the improved lighting is highly appreciated. As the result of trade depression, the revenue from the sale of gas showed a decline of £245, and the receipts from the sale of residuals were £228 less than those for the year 1907-8. The quantity of gas made was 85,820,000 cubic feet—a decrease of 3,623,000 cubic feet. The coal carbonized amounted to 7627 tons, or 353 tons less than in the preceding year. The make of gas per ton of coal carbonized, however, was 11,252 cubic feet—an increase of 44 cubic feet. Gas-cookers are still in brisk demand; the number in use being 852, a rise of 152; and more people are adopting gas for lighting their houses. The number of gas consumers is 2584, or 216 more than before. With a view to further popularizing the use of gas, the Committee have decided to reduce the price to all consumers by allowing an additional 2½ per cent. discount, making a total of 7½ per cent. for the prompt payment of accounts; the reduction to take effect in the accounts for the quarter ending the 30th prox. The Committee and the Gas Manager (Mr. J. Baldwin) were congratulated on the extremely satisfactory results obtained during the past year, notwithstanding the very heavy expenditure in renewing mains and services and the slight falling off in sales of gas and residuals.

Canadian Natural Gas.—News has been received that the great gas-well unexpectedly drilled on the Tilbury oil-property of the East Tilbury (Canada) Company, at London, is now giving an increased production of 5 million cubic feet a day. Further drilling for oil is impossible, owing to the large volume and high pressure of the gas; and it is thought that the Company will find it necessary to go into the gas business. Many oil-field towns in Canada are, as is well known, lighted by means of natural gas.

Fatal Gas Explosion at Southport.—Last Wednesday, a fatal gas explosion occurred at a grocer's shop in Southport. It appears that customers had remarked on the smell of gas in the premises, and the proprietor of the business, Mr. Isaac Nuttall, entered the front sitting-room carrying a lighted taper. The result was an explosion which not only did considerable damage to the premises, but caused the death of a girl ten years of age, who was thrown with great force against a wall. Though conscious when medical assistance arrived, she died shortly afterwards—it is thought struck with a brick. Mr. Nuttall was severely burnt, and had to be removed to the Infirmary.

Mitcham and Wimbledon Gas Company.—At the half-yearly meeting of this Company on the 31st inst., the Directors will report a satisfactory increase in the sales of gas in the six months ending the 30th of June, compared with the corresponding period of last year; but the decline in the markets for residuals has adversely affected the revenue therefrom. The half-year's working produced a profit of £11,455; and the sum available for distribution (£16,793) enables the Directors to recommend the payment of the increased dividend at the rate of 5¾ per cent. per annum to which the proprietors are entitled under the sliding-scale, consequent upon the reduction of 2d. per 1000 cubic feet in the price of gas.

Use of Tar on Roads.—At the last meeting of the Malling Rural District Council, the Surveyor (Mr. Marshall) reported that he had tried all round the district to get tar for finishing off the tar-painting of the roads, but had not succeeded; the County Council having the first chance. They required another 80 barrels to finish tar-painting in Snodland, and about 140 barrels to finish the whole of the work. Early on Monday morning last week, a tar-boiler belonging to the Llandudno Urban District Council, which was being used in connection with the tar-spraying of the roadways for the prevention of dust, caught fire, and the flames spread to the recently-tarred roadways, some considerable area of which was blazing for a time.

Cost of the New Water Scheme for Stockport.—During the discussion, at a recent meeting of the Stockport Town Council, on the Water Committee's accounts, Mr. Brewster declared that the town had lost on the Kinder water scheme a sum of £100,000, or about equal to the cost of their new Town Hall. The abandonment of the original scheme at Kinder, for the substitution of the present works, had cost £168,000, of which amount about £68,000 had been used in connection with the present scheme. He alleged that a great deal of the money had been lost by reason of mismanagement and want of foresight on the part of certain members of the Council. Alderman Bell, in reply, admitted that a mistake had been made; but he said it was not right to assert that the whole of the £100,000 had been wasted. Now that the mistake had been rectified, they would have a reservoir that would be perfectly safe.

Condition of Gas-Mains at Halesworth.—At the monthly meeting of the Halesworth Urban District Council on Monday last week, a letter was read from the Secretary to the Halesworth Gas Company to the effect that the Company were desirous of testing their mains and pipes, with a view to the discovery of leakages, and asking the permission of the Council to drive down iron bars in the roads, and, where found necessary, to break up the roads, in order to renew or repair the mains or pipes—undertaking to make good the roads so broken up to the satisfaction of the Surveyor. In the discussion that ensued, the opinion was expressed that the gas-mains throughout the town were in an unsatisfactory condition, and that practically all of them needed relaying. It was eventually resolved—"That, in the opinion of the Council, all the gas-mains in the town require to be renewed, and consequently they cannot accede to the application; but that the Council would be prepared to favourably consider a scheme for relaying all the mains in sections."

Slot-Meter Padlocks.

Mr. H. Mitchell writes (under date of Aug. 12): My attention has been called to your issue of the 3rd inst., where you have a notice of Mr. R. B. Reeves' "Patent Slot-Grip Bolt" to my M & M patent lock. You say Messrs. George Glover and Co. (who are the agents for the Reeves patent) "have adapted the bolt to their 'M & M' patent four-lever lock." This is not their patent; it belongs to me. They are the agents only. Will you kindly put this right?

Buenos Ayres Water Supply.—According to a paragraph in "The Times," a Bill has been presented to Congress by the National Executive for the authorization of the extension of the sanitary works of Buenos Ayres. It is proposed to expend a sum of £3,600,000 upon the water supply; the new works to include an intake tunnel, filters, new pumps, and piping. The necessary funds are to be raised by the issue of special bonds bearing 5 per cent. interest and 1 per cent. amortization.

Manchester Corporation Gas-Coal Contracts.—Tenders for the supply of the coal required during the ensuing year by the Gas Department were under consideration at a special meeting of the Gas Committee of the Manchester Corporation held last Wednesday under the presidency of Alderman Gibson, the Chairman. The orders placed for coal by the Corporation total between 350,000 and 400,000 tons; and the accepted tenders being at a figure of nearly 1s. per ton less than those of last year, the saving effected is estimated at a little short of £14,000. The new contracts take effect from the 1st prox.

Plymouth Water Supply.—At the meeting of the Plymouth Town Council on Monday last week, Mr. C. H. Tozer, on the presentation of the minutes of the Water Committee, complimented the Water Engineer (Mr. F. Howarth) on his saving £2513 on his estimate for the trunk main. Mr. Bond, on a report that "any extension of the existing means of conveying the water between the Burrator and Roborough reservoirs should be on the lines of rendering the leat permanently serviceable," expressed the hope that it did not mean anything like the enormous capital outlay foreshadowed earlier in the report, amounting to £40,000. The pipes had never been intended as a substitute for the leat; and a great deal of money had already been spent on it with this object in view. It was much easier to keep the leat in repair than to make it serviceable after it had got into a state of disrepair. The Committee looked upon the pipes as supplementary to the leat, which they held should be maintained in a condition of effective service. Mr. S. Stephens moved that the minute should go back to the Committee for further consideration, and expressed the opinion that they should deal with the question of the leat boldly. Mr. Jacobs seconded this proposition. The Chairman of the Committee (Mr. Winnicott) said they agreed with Mr. Bond. The minute was accordingly referred back.

Proposed Water Supply for Hope.—A Local Government Board inquiry was held last Friday before Mr. A. G. Drury, at the Hall Hotel, Hope, into an application by the Chapel-en-le-Frith Rural District Council for sanction to borrow £4280 for water supply purposes for Hope. It was stated that a rate of 1s. 10d. in the pound would be required to pay off the loan in 30 years, principal and interest, at 3½ per cent. exclusive of the water-rents and maintenance. Mr. C. R. Brady, of Stockport, the Engineer for the scheme, stated that it was proposed to obtain the water from Jagger's Clough, four miles away, and pipe it to the village. Dr. Bennett, the Medical Officer of Health, said he had long advocated the provision of a water supply as being necessary for Hope. An alternative scheme less costly was pleaded for by Mr. Laycock, representing the Parish Council, and others; and the Inspector promised that the matter should be carefully considered.

Emergency Water Supply for Guildford.—At the meeting of the Guildford Town Council last Tuesday, reference was made to correspondence which had passed between the Water and Baths Committee and the Woking Water Company with regard to an arrangement under which the Company will supply the town with water in case of emergency. It was proposed that the Corporation should pay a minimum of £50 per annum as a fixed charge, in consideration of the Company allowing the necessary connections to be made to their mains at the expense of the Council; that all water supplied should be passed through meters, and be paid for at the rate of 1s. per 1000 gallons; that the Corporation should pay the annual charge for meter-rents in accordance with the Company's scale; that the agreement should be for three years; and that the Company should reserve the right of priority to the supply of water in their own district in case of necessity. The Town Clerk (Mr. F. S. Miller), on behalf of the Committee, recommended that an agreement should be made embodying the foregoing proposals; and, after some discussion, this was decided upon.

Reduced Prices for Gas at Halifax.—It was briefly mentioned in the last number of the "JOURNAL" that the price of gas at Halifax had been reduced. According to the statement of Mr. Collinson, when moving the adoption of the revised scale of charges at the meeting of the Council at which the reduction was sanctioned, the new charges within the borough for lighting purposes vary from 1s. 11d. to 2s. 1d. per 1000 cubic feet, with an intermediate price of 2s., and for gas-engines from 1s. 10d. to 1s. 8d., with an intermediate price of 1s. 9d. These prices are to be subject to an allowance of 1d. per 1000 feet, if the accounts are paid within the prescribed time. This arrangement does away with the sliding-scale of discounts at present in vogue. In the case of prepayment meter consumers, the reduction will be 1d. per 1000 cubic feet. The difference in the price charged to consumers beyond the borough has hitherto been 10d. per 1000 cubic feet. This has been reduced to 7d.; so that the prices will now be 2s. 6d. to 2s. 8d. per 1000 cubic feet for lighting purposes, and 2s. 5d. to 2s. 3d. for gas-engines, subject to the 1d. per 1000 cubic feet discount. With regard to the altered charge to prepayment meter consumers, it is intended to return the difference of 1d. when the money is collected.

Labour Co-Partnership.—Statistics have been published by the Labour Co-Partnership Association in regard to the progress of the movement. In 1883 there were only 15 societies working on labour co-partnership principles, and the capital involved was £103,436. The number of societies increased to 125 in 1903; but it now stands at 112. These societies, however, now have a capital of £1,941,112, against £1,649,859 five years ago.

Wombwell Gas and Water Supply.—According to the report of the Gas and Water Engineer of the Wombwell Urban District Council (Mr. R. Dawson Walmsley, B.Sc.), the gross profit realized by the Gas Department in the year ending March 31 last was £2366; the net profit being £876. The reduction of 3d. per 1000 cubic feet and the abolition of meter-rents, which came into operation at the beginning of the financial year, reduced the net profit by £488. On the basis of the previous year's price, the gross profit would have been £2854, and the net profit £1364. The working results showed a very decided improvement; the make of gas per ton of coal having been 11,010 cubic feet, compared with 9923 cubic feet in 1907-8. There was an increase of 3,366,000 cubic feet, or 8 per cent., in the gas sold, and a reduction of 4½ per cent. in the quantity unaccounted for. At the end of the year there were 2768 prepayment and 499 ordinary consumers on the books. The gross profit of the Water Department was £292; and the net profit £96. For the year 1906-7, there was a loss of £345, after paying £273 for loans and interest.

According to the correspondent of "The Times" at Stockholm, though the labour troubles in Sweden are causing great inconvenience—even the newspapers having suspended publication—the towns are lighted, in spite of the strike of the men at the gas and electricity works. A telegram from a private source in Stockholm received by our contemporary on Monday last week was to the effect that there was no danger of the gas or electricity supply being cut off.

The Council of the Institution of Junior Engineers are desirous of ascertaining if any of the members would be likely to join the Technical Reserve of the Territorial Force in connection with the Institution, supposing the conditions of service were suitable; and the Secretary (Mr. Walter T. Dunn) is sending out circulars to learn the views of the members on this matter, and also to obtain information as to whether any of them are already enrolled, and particulars of their rank and length of service.

In view of the importance to gas engineers and managers of the economical transportation of material, their attention may be called to a small pamphlet on "Ropeways and Cableways" issued by the Gilbert Little Company, Limited, of Bradford. Illustrations are given of the aërial wire ropeway erected by them for the Dalton Main Colliery Company, Limited, at their Silverwood Colliery. It is 1100 feet in length, and is built on the single-rope system; the coal carried being 50 tons per hour, running at a speed of 300 feet per minute.

APPLICATIONS FOR LETTERS PATENT.

17,862.—Kreidl, I., and Heller, G., "Mantles." July 31.
17,877.—Butterworth, A., "Gaslight appliance to enable the occupant of a bed to have control over the light while in bed." Aug. 3.
17,920.—Yates, H. J., "Gas-fires." Aug. 3.
17,921.—Akt.-Ges. Brown, Boveri, et Cie., "Controlling steam or gas turbines." Aug. 3.
17,954.—Goss, W. E., "Acetylene gas-generator." Aug. 3.
17,976.—Rees, I., "Internal-combustion engine." Aug. 4.
17,979.—Bradley, R., "Fittings for globes and chimneys for gas and electric lights." Aug. 4.
18,013.—Stubley, C. H., and White, F., "Separating dust and the like from air or gases." Aug. 4.
18,024.—Collins, W. F., "Gas-fired kilns." Aug. 4.
18,101.—Sprang, F. H., "Slip-on unions for pipes." Aug. 5.
18,107.—Foster, H. F., "Internal-combustion engines." Aug. 5.
18,119.—Foord, J. K., "Internal-combustion engines." Aug. 5.
18,123.—Tigges, F., "Gas-producers." Aug. 5.
18,139.—Bradley, R., "Globes and chimneys for gas lights." Aug. 6.
18,140.—Burt, P., "Internal-combustion engine." Aug. 6.
18,175.—Eady, L. H. & E. W. H., and Cash, J., "Incandescent gas-lamps." Aug. 6.
18,200.—Smith, N., "Carburettors for the manufacture of air gas." Aug. 6.
18,206.—Palmer, T. C., and Stead, J. C., "Deodorizing carbon dioxide." Aug. 6.
18,229.—Brocklesby, H., and Samuel Gratrix, Jun., and Bro., Limited, "Incandescent gas-burners." Aug. 7.
18,243.—Mowat, J., "Igniting and extinguishing gas-lamps." Aug. 7.
18,260.—Helps, J. W., and Pateman, J. W., "Mouthpieces of gas-retorts." Aug. 7.

The Directors of Crossley Bros., Limited, announce an interim dividend of 2 per cent. (actual), against 2½ per cent. last year.

At the Newcastle-under-Lyme Police Court last Tuesday, Edward Botham, who was charged, on suspicion, with contributing to the death of his sister-in-law by severing a gas-pipe and causing a leakage of gas into her house, was brought up again before the Magistrates, and discharged. A report of the inquest on the unfortunate woman appears elsewhere.

The Lighting Committee of the Dublin Corporation will, at the next meeting of the Corporation, submit a report advising the temporary appointment of Mr. Henry F. Cotton as City Gas Examiner in place of his father, who is now very ill; and they will add a recommendation that Mr. Cotton, jun., be temporarily appointed to assist his father in the general duties of the office.

John Wright and Eagle Range, Limited, have paid an interim ividend for the half year at the rate of 15 per cent. per annum; being ıe same as a year ago.

Considerable alarm was caused last Saturday morning by an exlosion beneath the pavement in Spa Road, Bermondsey, within a few ards of the scene of a similar occurrence last December. One of the oxes connected with the Bermondsey electric light system, situated ıst outside the entrance to the public baths, was blown off, and about dozen paving-stones were thrown in various directions.

A new Water Company is to be formed for the public supply of ıe residents at Chiddingfold and Dunsfold, in Sussex, where hitherto ome difficulty has been experienced with the wells in the district. Ir. S. Barrow, of Dunsfold, has some water-works of his own, and to ıem he proposes to add by purchase the works at Brook, owned by a lergyman. Some of the members of the Rural District Council at Iambledon, however, are opposed to the introduction of a private Vater Company; and consideration is to be given to the matter by a pecial Committee of the Council.

We have received from the Davis Gas-Stove Company, Limited, wo neatly got-up booklets, in artistic coloured wrappers, which they re issuing in connection with the radiator department of their busiess. One is entitled "House Warming Up to Date," and is inended to appeal more particularly to householders and private indiiduals; while the other, which bears the title of "Steamless Heating," deals with the subject in a more detailed and technical manner, and is written especially for gas engineers, architects, and other professional gentlemen of this class to whom such a system of heating would be likely to appeal. Both booklets are printed in colours, and are attractive in appearance.

The beggarly salaries paid by some municipal corporations have often been unfavourably commented upon in the "JOURNAL" and other publications; but little improvement is apparent. One of the London District Councils recently advertised for an Accountancy Clerk, not over 28 years of age, at a commencing salary of £50 per annum. By mistake, the salary appeared in the advertisement as £30. Among many satirical replies received one was as follows: "I have a desire to settle down in a permanent position, being married and having a family to support. The 11s. 6d. per week salary which I shall receive, if appointed, will probably pay the rent of a house suitable for the position of a municipal officer; and while I am attaining the maximum salary, I hope to be able to beg from a few friends some bread upon which to live, together with some left-off garments with which to appear at the municipal buildings at my daily work. . . . I am an efficient organist, and prepared to officiate at the parish church every Sunday; likewise a first-rate gardener, and would keep the grounds of the town hall in order in my spare time. In cases of emergency, I could deputize as tram or motor-car driver, or as town clerk, having a thorough knowledge of the law. . . . I would gladly study to qualify for any other duties you might desire me to perform."

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

ituation Vacant.

ASSISTANT DISTRICT INSPECTOR. Reading Gas Company.

ituation Wanted.

ENGINEER WITH EXPERIENCE IN RETORT ERECTION. No. 5119.
TRAVELLER - REPRESENTATIVE (WITH LONDON OFFICES). No. 5125.
SECRETARY, MANAGER, OR ACCOUNTANT. No. 5115.

lant (Second-Hand) Wanted.

ANNULAR CONDENSERS, &c. Aylesbury Gas Company.

lant, &c. (Second-Hand), for Sale.

CARBURETTED WATER-GAS PLANT, INCLUDING CONDENSERS AND TOWER SCRUBBER. Shanghai Gas Company.

Plant, &c. (Second-Hand), for Sale—*continued.*

MASON'S PRODUCER-GAS PLANT, COAL-ELEVATOR, &C. Reading Electric Supply Company.
STATION METER AND GOVERNOR. Widnes Gas-Works.
BOILER, ENGINE, AND WASHER. Dorchester Gas-Works.

Patent Licences.

ACETYLENE GENERATORS, LAMPS, &C. Haseltine, Lake, and Co., Chancery Lane, W.C.

Meetings.

BARNET GAS AND WATER COMPANY. Holborn Restaurant, Aug. 31, Twelve o'clock.
MITCHAM AND WIMBLEDON GAS COMPANY. Offices, Aug. 31, Three o'clock.
RIDDINGS DISTRICT GAS COMPANY. London Office, Aug. 31, Three o'clock.

TENDERS FOR

Coal and Cannel.

LIVERPOOL LIGHTING DEPARTMENT. Tenders by Sept. 2.

Boilers, Engines, and Exhausters.

SMETHWICK GAS DEPARTMENT. Tenders by Aug. 26.
WALLASEY GAS DEPARTMENT. Tenders by Sept. 15.

Tar.

BRADFORD GAS DEPARTMENT. Tenders by Sept. 16.

Washer and Tar Extractor.

WALLASEY GAS DEPARTMENT. Tenders by Sept. 15.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 437.

Issue	Share.	When Dividend.	Dividend or Dividen & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17¾—18¼	..	5 9 7
298,955	10	,,	7	Do. 7 p.c.	12½—13	..	5 7 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd. . . .	5⅝—5⅞	..	5 10 8
40,000	5	,,	6½	Do. New, £4 paid .	4⅜—4⅝	..	5 12 5
50,000	10	Feb. 25	15†	Bournemouth Gas and Water 10 p.c. . .	28¾—29¼	..	5 2 6
311,810	10	,,	7	B 7 p.c. .	16¾—17¼	..	4 1 2
75,000	10	,,	6	Pref. 6 p.c.	15⅝—15⅞	..	3 15 7
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	250—253*	+2	4 18 10
300,000	,,	,,	5½	Do. New . . .	190—192*	..	4 19 0
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122*	..	4 2 0
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	100—102	..	3 18 5
220,000	Stk.	Mar. 12	10¾	Brighton & Hove Orig.	213—215	+1	5 0 0
246,320	,,	,,	7¾	Do. A Ord. Stk. .	154—156	..	4 19 4
460,000	20	Apl. 16	10	British	43—43½	..	4 11 11
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c. . .	119—121	..	4 19 2
165,700	,,	,,	4½	Do. B 3½ p.c. . .	89—91	..	4 18 11
82,278	,,	,,	5½	Do. C 5 p.c. . .	108—110	..	5 0 0
50,000	,,	June 25	3½	Do. 3½ p.c. Deb. .	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13½—14	..	5 0 0
250,000	Stk.	June 25	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord. . .	106½-108½*	..	4 12 2
1,493,280	Stk.	Mar. 12	5 2/10	Commercial 4 p.c. Stk. .	109—111	+1	4 13 8
560,000	,,	,,	5	Do. 3½ p.c. do. .	105—107	+1	4 13 5
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	96—98	..	5 2 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
492,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord. .	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd. . . .	24¼—24¾	..	4 17 0
354,060	10	,,	12	Do. £7 10s. paid.	18¼—18¾	..	4 16 0
15,141,545	Stk.	Aug. 12	4⅔	Gas light and Coke 4 p.c. Ord. . .	104—105*	+1⅓	4 8 10
2,600,000	,,	,,	3½	3½ p.c. max. . .	87—89*	+¾	3 18 8
3,799,735	,,	,,	4	4 p.c. Con. Pref.	103—105*	..	3 16 2
4,193,975	,,	June 11	3	3 p.c. Con. Deb.	85½—86½	..	3 9 4
258,740	Stk.	Mar. 12	4¾	Hastings & St. L. 3½ p.c.	93—95	..	5 0 0
82,500	,,	,,	6¼	Do. do. 5 p.c.	118—120	..	5 4 2
70,000	10	Apl 29	11	Hongkong & China, Ltd.	17¾—18¼	..	6 0 7
123,570	Stk.	Mar. 12	6½	Ilford A and C . . .	141—143	..	4 10 11
65,780	,,	,,	5	Do. B	106—108	..	4 12 7
63,000	,,	June 25	4	Do. 4 p.c. Deb. . .	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental .	179—181	..	4 8 5
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	94—96*	+¾	3 12 11

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c. .	120—122	..	4 18 4
561,000	Stk.	Feb. 25	10	Liverpool United A. . .	228—230	+2	4 6 10
718,100	,,	,,	7	Do. B . .	168—170	..	4 2 4
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean.	4⅞—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met of Melbourne 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	4½ p.c. Deb.	102—104	+1	4 6 7
541,920	20	May 27	3½	Monte Video, Ltd. . .	12½—13	..	5 7 8
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	106½—107½	+1	4 3 9
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	91—93	..	3 15 3
15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½—20	..	5 0 0
55,940	10	,,	7	Do. 7 p.c.	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	137—139	..	5 15 1
60,000	5	Mar. 31	8	Ottoman, Ltd. . . .	6⅛—6⅜	..	6 5 6
3[illegible],800	53	Feb. 25	13	Portsea Island A. . .	140—142	..	4 16 11
60,000	50	,,	13	Do. B. . .	132—134	..	4 17 0
100,000	50	,,	12	Do. C. . .	123—125	..	4 16 0
114,800	50	,,	10	Do. D and E.	103—105	..	4 15 3
398,490	5	May 13	7	Primitiva Ord. . . .	7—7¼	..	4 16 7
796,980	5	July 29	5	Do. 5 p.c. Pref. .	5¼—5½	..	4 10 10
488,900	100	June 1	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
1,000,000	10	Apl 29	8	River Plate Ord. . .	16¾—17¼	..	4 12 9
312,650	Stk.	June 25	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	14—14½	..	5 10 4
62,500	10	,,	6	Do. 6 p.c. Pref. .	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49½—50½	..	4 19 0
135,000	Stk.	Mar. 12	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	233—235	..	4 5 1
523,500	,,	,,	10	Do. C	233—235	..	4 5 1
70,000	10	June 11	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Aug. 12	5⅔	South Met., 4 p.c. Ord.	119—121*	+⅝	4 8 1
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	84½—85½	..	3 10 2
209,820	Stk.	Mar. 12	8	South Shields Con. Stk.	153—155	..	5 3 3
605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	118—120*	+¾	4 11 8
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122*	+½	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord. . .	110—112	..	4 9 3
120,000	Stk.	Aug. 12	6⅞	Tottenham and Edmonton A 5 p.c. .	130—132*	+1⅜	5 4 2
453,940	,,	,,	5⅜	B 3½ p.c. .	109—111*	+¾	4 16 7
149,470	,,	June 25	4	4 p.c. Deb.	100—102	..	3 18 5
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	111—113	..	4 8 6
255,636	Stk.	Feb. 25	6⅝†	Wandsworth B 3½ p.c. . .	140—142	+1	4 13 4
79,416	,,	June 25	3	3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	,,	Aug. 12	5⅜	West Ham 5 p.c. Ord. .	124—126*	+1⅝	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref. . .	126—128*	+2½	3 18 2
253,300	,,	June 25	4	Do. 4 p.c. Deb. Stk..	110—112	+5	3 11 5

Prices marked * are "Ex div." † Next dividend will be at this rate.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.

See Illustrated Advertisement Aug. 3, p. 291.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Tolnol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

AMMONIACAL Liquor wanted. Brotherton and Co., Ltd., Ammonia Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

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J. W. & C. J. PHILLIPS, 23, College Hill, London, E.C., and 25, Bridge End, Leeds.

AMMONIACAL Liquor wanted. Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs. Telegrams: "Chemicals."

TO Gas Managers, &c., Wanted, Old Condemned GAS-METERS, from 1-light to 1000-light, for destruction to re-claim Metals. Write for Prices, Stating Quantities and Sizes, and if Wets or Drys. Scrap Metals, Drosses, Metal Shop Sweepings, &c., also bought.
J. Wilson, Pleasant Grove, York Road, King's Cross, London, N.

FIDDES-ALDRIDGE

SIMULTANEOUS Discharging-Charger. The one Machine which Discharges and Charges at One Stroke.

See Advertisement, June 22, p. VI. of Centre.

ALDRIDGE AND RANKEN,
89, Victoria Street, Westminster, S.W.
Telegrams: "Motorpathy, London." Telephone: 5118 Westminster.

GAS TAR wanted, Brotherton and Co., Ltd., Tar Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim House, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

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SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
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Telegrams: "Chemicals, Oldbury."

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Hallite Douglas, Limited, 106, Leadenhall Street, London, E.C.

MR. W. B. MIMMACK, for many years Secretary, Manager, and Accountant of the Crays Gas Company (111 Millions), now in Amalgamation, seeks APPOINTMENT in any or all of these Offices.
Address No. 5115, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

JOHN RILEY & SONS, Chemical Manu-facturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

PATENTS AND TRADE MARKS PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

APPLICATIONS for Appointments arranged effectively. Greatly appreciated by Recipients. Numerous unsolicited Testimonials. Write Now for Particulars.
Herbert Greatorex, Birchover, Matlock.

MR. WM. CRANFIELD, F.C.S., in re-sponse to requests, has decided to extend the work he has been carrying on by Gas Classes in various Yorkshire Towns for the past Ten Years, and to organize postal courses of Tuition in "Gas Engineering" and "Gas Supply." Close personal attention will be given to the needs of each individual Student, and Expert Assistance has been engaged. All Inquiries treated confidentially.
Full Particulars on Application to No. 11, Avondale Place, Halifax.

THE UNIVERSITY OF LEEDS.

DEPARTMENTS of Gas Engineering and Fuel and Metallurgy and Civil, Mechanical, Electrical, and Mining Engineering.
The work of these Departments is carried on in Separate Blocks of Buildings specially equipped for Systematic Instruction. Prospectus may be had free on Application from the Registrar.
The next Session begins on Oct. 5, 1909, on which day the entrance Examination will be held at Ten a.m. and Two p.m.

ENGINEER, with Experience in Retort Erection, both Horizontal and Vertical, in England and Abroad, seeks an ENGAGEMENT where his Constructional Skill would be of Advantage.
Address No. 5119, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

TRAVELLER, Gas Engineer, calling upon, and having Established Connection with, Gas and Water Companies, Corporations, &c., is prepared also to REPRESENT a Firm of Good Standing. West End Offices could be shared if desired.
Address No. 5125, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

READING GAS COMPANY.

WANTED, an Assistant District INSPECTOR. Age not to exceed 35 Years. Applicants are requested to send in full Particulars of their Age and Training, together with *copies* of recent Testimonials, and to state Wages required. No one need Apply who has not a thorough practical knowledge of internal Gas-Fitting Work, Incandescent Burners, &c., &c. A special knowledge of Main Laying is not necessary.
Applications to be sent in a soon as possible addressed to the Engineer, Gas-Works, Reading.

PURIFIERS—Set of Four, 12 feet Square, fixed complete, £300. A bargain. Also Four 6 feet Square, Two 8 feet, Four 8 feet, and Two 12 feet square PURIFIERS. Cheap.
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CONDENSERS—Clapham's, also Cutler's Water-Tube CONDENSERS. Pipe CONDENSERS, 4-inch to 10-inch diameter. Annular CONDENSERS, 8-inch, 10-inch, and 12-inch. Erected Complete and Cheap.
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Each set is capable of an output of 225,000 Cubic Feet per Twenty-Four hours.
The Plant is complete in every respect, and includes an Extra Set of Annular Condensers, and a Tower Scrubber, together with all necessary Valves and Connections.
Further Particulars can be obtained from the undersigned.
H. King Hiller,
Engineer-in-Chief.

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For full Particulars, Apply to the Reading Electric Supply Co., Limited, 55, Vastern Road, Reading.

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FOR SALE—Two Cornish Boilers, 10 ft. 9 in. by 4 ft. 9 in., including some Mountings, in good Condition. Insured for 60 lbs. working pressure. One Vertical TABLE ENGINE, 4-H.P. by Cockey and Sons; also a Cockey's HORIZONTAL WASHER, for 250,000 feet per diem. Being removed for extensions.
Frank Osmond, Gas-Works, Dorchester.

WANTED, a Set of Good, Second-Hand ANNULAR CONDENSERS, with 12-inch Valves and Connections Complete.
Particulars to G. Lane, Gas-Works, Aylesbury.

CITY OF LIVERPOOL.

THE Lighting Sub-Committee invite TENDERS for the Supply of 2000 Tons of GAS COAL or SLACK and 500 Tons of CANNEL to the Corporation Gas-Works at Fazakerley, for delivery over a period of Twelve Months.
Forms of Tender, returnable on or before Ten a.m., on the 2nd of September next, may be obtained on Application to Mr. A. G. Smith, Lighting Superintendent, Hood Street, Liverpool.
E. R. Pickmere,
Town Clerk.
Municipal Offices,
Aug. 9, 1909.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the Purchase of their Surplus TAR for One Year.
Form of Tender, with any further Information required, may be had on Application to Mr. C. Wood, Gas Engineer, Town Hall.
Sealed Tenders, endorsed "Tender for Tar," to be sent to me on or before Thursday, the 16th of September, 1909.
The highest or any Tender will not necessarily be accepted.
Frederick Stevens,
Town Clerk.
Town Hall, Bradford,
Aug. 11, 1909.

COUNTY BOROUGH OF SMETHWICK.

ENGINES AND EXHAUSTERS.

THE Gas Committee are prepared to re-ceive TENDERS for the Supply, Delivery, and Fixing of two Sets of COMBINED ENGINES and ROTARY EXHAUSTERS to pass 100,000 Cubic Feet per Hour each.
Further Particulars and Specification may be obtained from Mr. Vincent Hughes, Engineer, at the Gas-Works.
Tenders, endorsed "Exhausters," and addressed to the Chairman of the Gas Committee, to be delivered to the undersigned not later than the 26th inst.
The Committee do not undertake to accept the lowest or any Tender.
W. J. Sturges,
Secretary.
Council House, Smethwick.

WALLASEY URBAN DISTRICT COUNCIL.
(Gas and Water Department.)

TO ENGINEERS, BOILER MAKERS, AND MAKERS OF GAS PLANT.

THE Wallasey Urban District Council are prepared to receive TENDERS for the Supply, Delivery, and Erection of a TAR EXTRACTOR, ROTARY WASHER, ROTARY EXHAUSTER and ENGINE, and LANCASHIRE BOILER, at the Gas-Works, Poulton-cum-Seacombe.
Plans may be inspected, and *copies* of Specifications obtained, on Application to the Engineer, Mr. J. H. Crowther, at his Office, Dock Road, Seacombe.
Sealed Tenders, on Forms provided for the purpose, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Extractor and Washer," "Tender for Exhauster and Engine," "Tender for Lancashire Boiler," as the case may be, to be delivered per Post, at my Office as below, not later than the morning of Wednesday, the 15th of September, 1909.
Tenders arriving after that time will not be considered.
The Contractor will be required to enter into a Bond, with approved Sureties, for the due Performance of the Contract.
The Council do not bind themselves to accept the lowest or any Tender.
By order,
H. W. Cook,
Clerk and Solicitor to the Council.
Public Offices, Egremont,
Cheshire, Aug. 14, 1909.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Holborn Restaurant, 218, High Holborn, London, W.C., on Tuesday, the 31st day of August, 1909, at Half-past Twelve o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last; to declare a Dividend; and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 18th to the 31st of August, both inclusive.

By order of the Board,
ERNEST W. DREW,
Secretary.

Offices: 6 & 7, Queen Street,
Cheapside, London, Aug. 9, 1909.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, Nos. 6 & 7, Queen Street, Cheapside, in the City of London, on Tuesday, the 31st day of August, 1909, at Three o'clock in the Afternoon, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last; to declare a Dividend; and to transact the General Business of the Company.

And NOTICE IS HEREBY FURTHER GIVEN, that, immediately after the transaction of the Business of the above Meeting, an EXTRAORDINARY MEETING of the Shareholders of the above Company will be held for the purpose of authorizing the raising, by the creation and issue of new Preference Shares or Stock of the Company, a sum not exceeding in the whole (including any premiums which may be obtained) £5000; being a further part of the additional Capital of £20,000 authorized by the Riddings District Gas Order, 1903.

By order of the Board,
ERNEST W. DREW,
Secretary.

Offices: 6 & 7, Queen Street,
Cheapside, London, Aug. 8, 1909.

MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.

(INCORPORATED BY ACTS OF PARLIAMENT, 1867 AND 1907.)

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Offices of the Company, Western Road, Mitcham, in the County of Surrey, on Tuesday, the 31st day of August, 1909, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of Accounts for the half-year ended the 30th day of June last; to declare a Dividend; and for General Business.

The REGISTER of TRANSFERS of the CONSOLIDATED ORDINARY STOCK WILL BE CLOSED from the 16th inst. until after the Meeting.

By Order of the Directors,
BENJAMIN GREEN,
Secretary.

Offices and Works:
Western Road, Mitcham,
Aug. 10, 1909.

THE Proprietor of the Patents No. 7188 of 1901, for "IMPROVEMENTS IN OR RELATING TO ACETYLENE GAS-LAMPS or GENERATORS;" No. 11,612 of 1902, for "ACETYLENE GAS-LAMP for TABLE USE; No. 23,629 of 1903, for "IMPROVEMENTS IN ACETYLENE GAS-GENERATORS;" No. 10,185 of 1905, for "IMPROVEMENTS IN ACETYLENE GAS-GENERATORS" is desirous of entering into Arrangements, by way of LICENCE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring their full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to HASELTINE, LAKE, AND Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

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MODERN METHODS OF SAVING LABOUR IN GAS-WORKS

(WITH SIXTY ILLUSTRATIONS),

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Barrister-at-Law.

London: WALTER KING, 11, Bolt Court, Fleet St., E.C.

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PIPES and CONNECTIONS, $1\frac{1}{2}$ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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THE JOURNAL OF GAS LIGHTING WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CVII. No. 2415.] LONDON, AUGUST 24, 1909. [61ST YEAR. PRICE 6d.

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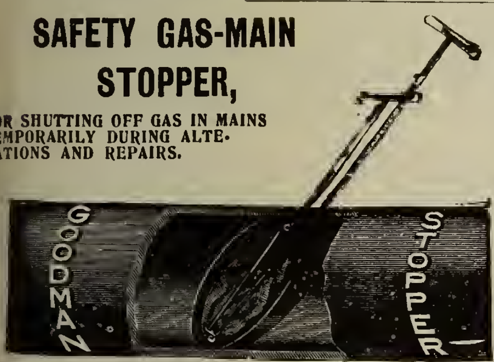

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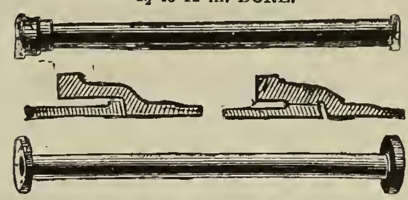

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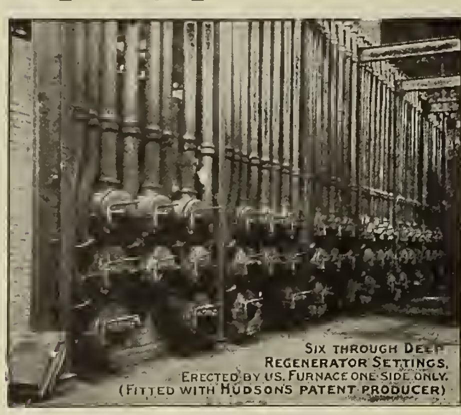

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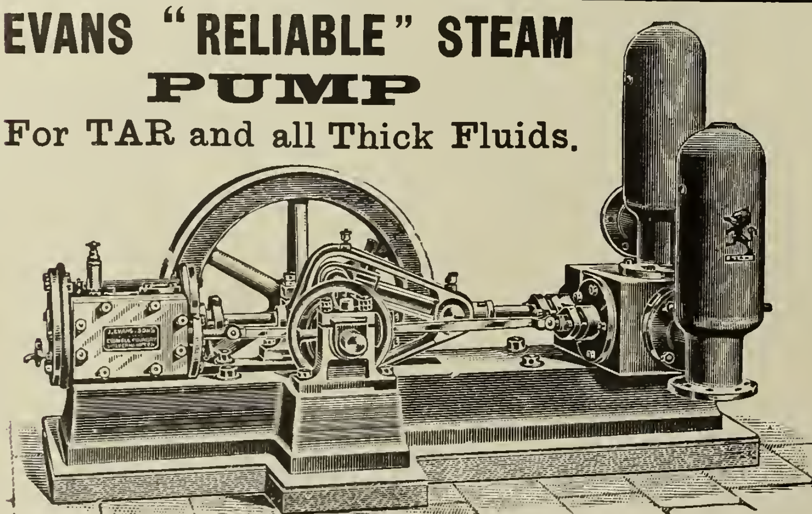

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CONTENTS.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Gas Workers and Unemployment Insurance.

The development of the Government scheme for insurance against unemployment is a matter that will be closely watched by the gas industry—an industry providing such extensive and regular employment for labour—both on account of the additional financial liability that it promises to impose, and the additional work that it will entail. In framing a scheme like the one now under notice, consideration should be given to the conditions of employment, as to whether it is permanent or otherwise. The workers of the gas industry, except the small proportion—and it is a diminishing proportion—who are taken on during the winter season, when work generally is at its lowest point, can count upon their employment being continuous, so long as their conduct and interest in their work are good. They have no reason whatever for insuring themselves against unemployment; and if they were given the option of doing this, the majority would certainly, we venture to think, decline to insure. Much less ought such employers as gas undertakings—company or municipal—to be forced to take upon their shoulders, other than perhaps for their winter hands for the time they are in their employ, the additional obligations the Government are proposing to put on them. To illustrate the point, the South Metropolitan Gas Company in their accounts set out half yearly the total sum paid in wages. Last half year, £256,760 was distributed among the workmen; and of this £51,109 is the amount paid as carbonizing wages. It is only, generally speaking, in the class of labour represented in the latter sum that there is now any fluctuation between winter and summer employment; and the extra work is given in the winter when the pinch of unemployment is most severely felt. We entirely fail to see why it should be made obligatory upon employers who provide work in this way, in greater part free from the hazards by which other classes of employment are obsessed, to contribute to the insurance of men whose only chance of being deprived of their employment is misconduct or incompetence. It appears to us to be an anomalous position to insure against unemployment, when good behaviour is the only premium asked to ensure constant employment. Besides well paid and permanent employment, the gas worker is hedged about with consideration on the part of his employers, all of which costs money; and, in full measure, is this so in the case of the co-partnership companies. Of course, the anticipated answer to this will be that the well-favoured industries must be made, in these days of social reform, to assist in bearing the burdens of those that are less favoured. But let it not be forgotten that the gas industry affords less scope, through the character of its business, for mechanical operation than most other industries.

The scheme of the Government has not assumed definite shape yet; but Mr. Winston Churchill, the President of the Board of Trade, since he introduced the matter to the House of Commons, has imparted through another channel information as to the lines the project will take. It is proposed that it shall be compulsory and contributory, and be divided up into different sections for different trades. Contributions are to be from men, masters, and the State. The amount of contribution is not yet fixed. But it will be something like 2½d. per week per man from each of the three sources of income—that is to say, insurance against unemployment will mean an average cost for each worker, whether in permanent work or merely temporary employ, of 7½d. per week. The estimate of the amount the State will have to contribute (which amount will also largely come from the taxation of industry) will be £1,500,000; so that it would seem the total annual cost of the project is computed at about, or not far short of, £4,500,000. There is something more than this direct cost. The expense of collection it is proposed shall fall upon the employers. From each worker's wages the employer, it is contemplated, shall deduct 2½d. a week, and to make contribution of a like amount—attaching stamps to the value of 5d. upon the worker's card, or else send, with a cheque for the total sum due, the bundle of cards for stamping to the nearest labour exchange, through which employment will be found for men thrown out of work, or for a period a weekly out-of-work allowance will be paid. The burdens and the unproductive expenditure of industry are growing. The proposed fresh burden is easily calculable. Take the case of a gas undertaking employing 500 hands, it means a direct expense of £270 16s. 8d. a year; or supposing the Gaslight and Coke Company were employing, to take a round figure, 10,000 men when the scheme comes into operation, it would mean an annual charge of no less than £5416, without the cost of the weekly work entailed. It is not intended, in the first instance, to apply the scheme to all industries. The seasonal and cyclical fluctuations of labour have been inquired into; and it is proposed to apply the project at the outset to industries that are found to be most severely affected—such as building, shipbuilding, engineering, construction works generally, and vehicle making. It is not clear whether the gas industry will be brought into any one of these classes; it is just possible it may be partly, if not wholly.

The scheme is excellent enough in its intentions; but it seems, on first examination, as though it is going to be a costly method of effecting but a moderate amount of good. Among the advantages, it is believed by the principal creator of the scheme that assurance against evil days will assist in causing the worker to pay less heed to the promises of revolutionary Socialism. But what does "revolutionary "Socialism," as represented by Mr. Will Thorne, say to the project? He asserts that wages are already too low, compared with the growth of the national wealth, and that the entire cost of the insurance scheme—like old-age pensions—should be borne by the State. Mr. Thorne announces his intention of advising the members of the Gasworkers' Union to resist any attempt at compulsory deduction from their wages. It is further believed by Mr. Churchill that the scheme will create a common interest between employers and employed. Compulsion has never effected that; but a voluntary co-partnership has. Certain trade unions who provide out-of-work pay are not at all pleased with the scheme, believing that it will do something to undermine their position, power, and utility.

The Old Restriction.

Gas supply being a *quasi*-public service, there seems to be a fitness in supposing that the public take some interest in the qualitative evaluation of the popular commodity. But as a matter of fact, the public does not do any such thing; and what is more does not care a jot for, or trouble its head over, the question. Its knowledge and views on the subject are embraced within the ample covering expressions "bad" or "good"—just as it happens that their fittings are in, or are not in, condition and order to render the most efficient service by the use of the gas supplied. There has recently been an article in "The Times" by Professor Frank Clowes (*ante*, p. 366) and a letter by Mr. G. M. Gill, on the subject of "A Calorific Test for Coal Gas" (p. 524). It is not thought for a moment that the portion of the public who are readers of "The Times," and are not interested in gas supply in any other capacity than that of consumers, have paused to read anything more than the headings to the communications on the subject in our morning contemporary. But the article and letter may have caught the eyes of sundry of our legislators; and if they have done so, they have no doubt helped to pave the way to the dismissal of a standard and test of quality that are to-day incongruous with the use of the commodity.

Mr. Gill speaks of the desirability of freedom from all restrictions for a supply subject to such competition as gas is from electricity. This question of absolute freedom was

dealt with in these columns only last week; and there is nothing to add to what was then said. Then he proceeds to make a point (which has been a matter of complaint in our columns for years past) as to the injustice that exists between gas and electricity supplies, in that the latter is not subject to standards, penalties, and supervision in the same manner that gas is, but has complete liberty—perhaps too much liberty for the good of the ratepayers in areas where the electricity undertaking is a municipal concern—in the conduct of the business. It is, however, submitted by Mr. Gill that "there would not be so great an objection to standards "and penalties on the part of gas-supply companies were "electrical undertakings placed in a similar position." This is true in a degree; but only in a degree. The fact that electricity suppliers were subjected to standards and penalties would not remove the objections—and they are well-founded objections—in the gas industry to standards and penalties, and to the elaborate supervision that savours of gas undertakings being all suspect.

While opposed to dual standards and testings for gas, recognition is made in the letter of the strong feeling that gas engineers entertain regarding the illuminating power standard being abolished in favour of a calorific power one. It is interesting in this connection to learn that, "so long as "there are tests with which compliance must be made, gas "companies will endeavour to advise Parliament by intro-"ducing into their Bills whatever alterations they deem "necessary in the interests of the public." Reading this in conjunction with the "strong feeling" that exists among gas engineers, there ought to be a shoal of gas measures in Parliament shortly asking for the abolition of the illuminating power standard, with or without a calorific power standard in substitution, just as the gas companies "deem neces-"sary in the interests of the public." We are afraid that a long experience of Parliament in relation to gas matters has not hardened belief in our law-makers readily accepting advice that Gas Companies embody in their Bills affecting the general principles of control in gas supply. Our legislators seek at the back of these things for self-interest, as well as for the public weal; and they seem to think they find that for which they search, and so the way to reform is both difficult and long. However, it is good to take every opportunity for informing as to the true position those who, though without technical knowledge, have influence in these matters. In this instance, their increased information regarding the injustice, antiquity, and inappropriateness that are wrapped about the illuminating power standard for gas may help to hasten redress by the removal of the old encumbrance, though it may not be without the institution of a fresh standard, but one that will be in accord with the modern trend of both gas manufacture and application.

The Inverted Burner.

With the exception of the classical researches of Professor Drehschmidt, the inverted incandescent gas-burner has not undergone that extended investigation that it might have been supposed its merits would have commanded; and though the inverted burner in itself is a small thing, and comparatively simple in the structure which returns to the user a high efficiency if he will only give attention to one or two modest requirements, its advance to the present degree of perfection has come about in very piecemeal fashion and by a very long road. Mr. Henry O'Connor, in his lecture to the Irish Association, has done good service in summing up the essentials for a good inverted gas-burner, and the conditions of use. His lecture does not enlarge the store of information; but it concentrates many useful points, from some of which it would not be a bad thing if Mr. O'Connor would pursue investigations, and supplement what he has now said.

The blunt assertion with which the lecturer commences jars upon one a bit: "That this [the inverted burner] is the "reverse of scientific, will be gainsaid by no one." We should have preferred that Mr. O'Connor had not employed the word "scientific," but had used the expression "natural," in view of, as explained a few lines after, the reversal of the laws of Nature by the flame burning downwards. It is not due to the inverted burner that it should be in any way degraded by the epithet unscientific; inasmuch as it is through the application of science to an unnatural condition of things that has brought to us one of the best and most economical of lighting appliances, which has gained rapid popularity in the houses of rich and poor alike, in shops, and in the streets. But though Mr. O'Connor approaches his task by setting the inverted burner beyond the pale of scientific title, he re-establishes it in estimation by his free acknowledgment that it is the best lighting instrument that gas has, in that it gives the highest illuminating efficiency of any burner, as it dispenses at least 76 per cent. of its light below the horizontal. It is anomalous that there should be any justifying ground whatever for describing an article of utility as being unscientific when it is the most efficient instrument for the purpose of ordinary artificial illumination. But there is the fact; and there is complete contentment with this useful, unorthodox appliance of the gas industry.

Many matters are treated upon in the lecture. Perhaps most interest is found in Mr. O'Connor's exercises regarding the theoretical quantity of air required to ensure complete combustion with coal or water gas of the compositions that he names. He finds that 4·9 cubic feet of air are needed for each cubic foot of coal gas of the composition described; and 3·13 cubic feet of air per cubic foot of carburetted water gas, also of quoted composition. Now this is one point upon which Mr. O'Connor might very profitably devote himself to further inquiry. And that is as to the relationship between his theoretical figures and the proportion of air admitted into the mixing-tubes of both upright and inverted burners to attain from the burners and a given composition of gas the highest efficiency. It is well known that the inverted burner per cubic foot of gas requires less air to attain maximum efficiency than the upright burner. Dr. Bunte has devoted inquiry to this matter. For the moment it is not within recollection whether he stated the composition of the gas. However, he found with the gas he employed that three volumes of air were required to enter the mixing-tube of the upright incandescent burner to one volume of gas; but in the inverted burner only two volumes of air were required to one volume of gas. Notwithstanding that in the inverted burner the requisite admission of air recedes materially from the theoretical proportion necessary for complete combustion, the efficiency of the burner is greater than the upright burner, in which air admission more closely approximates the theoretical quantity. The point is an interesting one, and well worthy further investigation. Another point that has relation to this is the vitiation of the primary air supply by the products of combustion, and the consequent loss of efficiency. The sooner the makers of certain burners on the market realize how much inattention to the diversion of the products of combustion tends to disparage their burners, the better will it be for their future; for the deadening effect of the products of combustion on the temperature of the flame is so widely recognized now that—at any rate, the large—buyers will see to it that proper protection of the primary air supply is provided in the burners they purchase.

While on this point, reminder is given that belief and scientific propriety are constantly being shocked, just as the highest results from practical conditions are sometimes secured by the abuse of theoretical considerations. While most of us not only believe but know, that the nitrogen, carbon dioxide, and water vapour of the products of combustion, when allowed to deteriorate the primary air, have a lowering effect on the temperature of the flame, a new gas-lamp was introduced to notice the other day in which there is a cluster of duplex burners—inverted below and vertical above. The makers of this lamp declare that, by collecting the products of combustion from the inverted burners, and passing these products (with a small addition of gas) into the vertical burners above, they are able to secure the incandescence of the mantles, and with considerable economy. The explanation given by the photometrists who have investigated these claims is insufficient to satisfy the sceptic, when the character of the principal products of combustion is considered. To talk of just sufficient gas being passed in to revivify the products of combustion flowing to the vertical burners, is a plausible way of putting the matter to the layman; but while the fresh gas is supposed to revivify the products, what corrupting and, on combustion, temperature reducing, effects have these products upon the coal gas? If, too, the claims have real foundation, then why trouble over the percentage of nitrogen and carbon dioxide contained in ordinary gas? However, if the assertions of the makers of the lamp in question can be substantiated by other tests, there is an interesting problem here for consideration and explanation. But admittedly elementary considerations leave us for the present among the sceptics. The mention of this matter merely arises out of the lecture by Mr. O'Connor, in which there is much information useful to those who have not made a close study of the inverted gas-burner.

Value of Road Tar-Dressing.

The experience of the South Metropolitan Gas Company mentioned by the Chairman (Mr. Charles Carpenter) at the recent meeting, that greater quantities of tar are now being absorbed for dustless road-making, is that of most other gas undertakings in the country. It is a case though of being thankful for small mercies—thankful for anything coming along that will assist in diminishing supplies. We hear of county councils tar-painting large tracts of main roads, of experiments being ubiquitous, of various authorities giving the borough engineers and surveyors instructions to tar-paint extensively—such as the Middlesex County Council all the main county roads, and the Fulham Borough Council the whole of their macadamized roads; but the supply of tar (through increasing coal carbonization, and the adoption of bye-products recovery plant in connection with coke-ovens), with all this increasing activity and application, does not allow the price of the commodity to rise. Five years ago at this time, the market quotation in our columns was 16s. to 21s., while this week the figures are 16s. to 20s.; and these figures have fluctuated downwards by shillings during the intervening years. It would be venial envy on the part of a gas manager in this country to wish, in regard to tar, that his circumstances were akin to those of Mr. W. Arnott, the Manager of the South African Lighting Association, who was telling us only the other week (*ante*, p. 192) that last summer he sold 60,000 gallons of tar at 6½d. per gallon at the Port Elizabeth works. Sixpence halfpenny per gallon! Several towns in the Colony are experimenting with tar for road purposes; but "there is a difficulty owing to the lack "of tar, for many South African towns have installed elec- "trical undertakings, but have no gas supply." A lack of tar would be a novel experience in this country; and for South Africa it affords yet another argument against the choice of the authorities of many small towns in adopting electricity plant instead of gas-works.

The main thing is that in this country no outlet for the commodity can be despised, though prices are not materially improved. Better to have prices maintained than depreciated. This being the position, there must be gratification at the extension of the use of tar by road authorities, whose technical advisers for the most part are confirmed in their belief that there is nothing like tar for road-surface dressing. But borough engineers, road surveyors, and others having official relationships with the responsible road authorities have, in many directions, found difficulty in persuading their administrative superiors that value is received for the expenditure in this direction; and it would not be at all a bad thing if members of these authorities were supplied with literature on the subject, by those having tar for sale (the same as farmers are with literature by the Sulphate of Ammonia Committee), including the experiences of authorities who are thoroughly convinced as to the tar-dressing of roads being an expenditure that brings in its train both economies and comfort. The Metropolitan Paving Committee appointed by the Metropolitan Borough Councils some time ago have been collecting information on this subject from the technical officers of the local authorities; and several of their views are reproduced elsewhere in this issue. The reports are practically unanimous in testifying to the utility of treating macadam and gravel roads with tar; and it seems pretty clear that, apart from the suppression of the dust nuisance, the employment of tar in the construction of roads and for top-dressing will continue to increase as a valuable economical procedure through the savings that are effected, and as adding, through cleanliness, to the pleasantness of street usage. The reports inform us that road surfaces are preserved; that there is less surface disintegration; that the expenditure on road cleansing, watering, and maintenance is considerably lessened compared with the case of roads not so treated; and that, after rain, the roads dry quickly. This point reminds again of Mr. Arnott's letter. The heavy rains in South Africa, and the wild rushing of the water down the steep streets, formerly did much expensive damage, and caused great inconvenience. This has been changed. Tar-surfacing has proved the preservative against the mischief wrought by the rain floods, which pass over the water-proofed surfaces "without," quoting Mr. Arnott, "causing any damage." If tar-surfacing will resist such violence, how much more will it resist the lighter rainfalls of this country? The fact of the matter is that the application of tar as an agent for the mitigation of a nuisance has proved its economic value to be of such a varied and substantial nature that it is becoming a necessity, and not merely an expedient to a single end in dry weather.

The method of applying the tar, it is seen by the reports, is still a matter over which opinions and practices are unsettled. But, generally speaking, the application of the tar by hand rather than by mechanical spraying has the larger number of adherents; through the tar being better worked in, more evenly distributed, and consequently more durable. There should be a passing warning against the blind worship of too great refinement of method in this matter, as this means additional and not requisite cost. Again turning from London to South African experience, all that is done there is to take tar, cold and crude, direct from the gas-works, spread it by hand, and work it in with rubber squeegees on a well-prepared surface, dusting over afterwards with fine quarry grit; and this treatment stands rough usage to which road surfaces at home are not subject. It will be seen that the cost of tar-surfacing in the London Borough Council areas varies from ½d. to 1½d. per yard super—the difference being partly owing to the variation in the method of treatment, and partly to the fact that the returns manifestly are not uniform in the items constituting the charge. The disadvantages that are mentioned in the returns are few and insignificant compared with the advantages; and any borough engineers who are not over-impressed by a small trial on their own account would do well to compare notes with those fellow professionals who are enthusiastic in praising the virtues of tar as an economy producer by employment for road dressing. The experience, too, is generally opposed to the proprietary or titled dust-preventatives, and in favour of tar. It is found that the former are more costly; that redressing with them has to be done at short intervals; and that they have not the multiple advantages of the gas-works product.

The Restraint of High Illuminating Power.

In the "Journal" this week, the proceedings at the meeting of the Liverpool Gas Company are reported; and notice is made of the report and accounts of the Sheffield United Gas-light Company. Towards the close of the report of the Sheffield Company, an announcement is made (which, by the way, will be of peculiar interest to our friends at Widnes, seeing that the Sheffield Company have been treading so closely on their heels in the matter of charges) that the sanction of the shareholders is to be obtained to an application to the Board of Trade for a Provisional Order, for, among other purposes, the modification of "the apparatus "for testing the quality of the gas supplied by the Company, "and to reduce the standard for the illuminating power "thereof to 14 candles." In the speech of the Chairman at the meeting of the Liverpool Gas Company (Mr. H. Wade Deacon), are these remarks: "The Board had experienced "considerable difficulty with regard to the supply of cannel. "Owing to the lamentable disaster at the Maypole Colliery, "which supplied them with the bulk of their cannel coal, "their supplies were cut off; and it was for a time hard "to maintain the high standard usually observed." Low-power gas gives liberty; high-power gas and the use of cannel restrict the field from which the supplies of the raw material can be drawn. In the case of the Liverpool Company, in the twelve months ending June 30, the quantity of coal carbonized was 267,663 tons, of which 60,588 tons were cannel (excluding oil); and the cost of coal, oil, &c., showed a decrease of only £1612, in comparison with the preceding twelve months. The Sheffield Company, on the other hand, carbonized 329,159 tons of coal in the twelve months ending June, of which 31,547 tons were cannel; and they saved within a few pounds of £20,000 on their coal bill, in comparison with the preceding year. The Liverpool Company are, in contrast, paying dearly to maintain the "high stan- "dard usually observed;" and the small saving of £1600 suggests that they do not reap such tangible benefit from reduced market prices of coal as those companies who are not bound to a high candle-power gas. When the Sheffield Company obtain the liberty of supplying (instead of under a 16½-candle standard) 14-candle gas (in accordance with the parliamentary model clause), tested by the modern burner approved by Parliament, the Board of Trade, and the Metropolitan Gas Referees, the more favourably will they stand in contrast with the price that the Liverpool Company pay in money and anxiety to bolster up their fetish of a high standard gas. Reports come to hand of towns sending out now about 50 per cent. of their gas in the daytime. Illuminating power is not an essential of that gas. Three-

quarters of the remaining output, it is calculated, is used during the hours of darkness in incandescent gas-burners. Illuminating power is not an essential of the gas used in those burners. Then why are the Liverpool Company still clinging to their "usual high standard," which is unusual elsewhere, and which prevents them making the best advantage of a broad area from which to draw their coal supplies, and a widely open market in which to effect their dealings? In making comparison of the figures, it was disappointing to find that neither the Sheffield nor the Liverpool Companies includes the ordinary statement as to gas made and sold, the absence of which statement eliminates much of the interest that, as a rule, attaches to a technical examination of gas accounts.

Free Maintenance.

Actual personal contact with consumers is the best protection of interests and property that a gas undertaking can have; and one of the best ways in which actual contact can be secured, and continued satisfaction be assured, is by the free maintenance of incandescent burners—consumers merely paying for renewals; gas suppliers undertaking the cleaning and adjustment without charge. Gas companies who have departed from fixed charges to free maintenance have had encouraging experience. The Croydon Gas Company are one of the latest to adopt the system; and they anticipate that a large proportion of their consumers will soon be availing themselves of this service. Apart from the satisfaction that the resulting good lighting affords, the object-lesson is useful that householders have by seeing how the adepts of the gas suppliers perform the occasional work required to maintain, in a high degree of efficiency, the most economical of lights. The feeling engendered among consumers of a direct interest on the part of the gas suppliers, has also excellent effect. This is not sentiment; it is business. It costs money; but it is money well invested. There is no question of showing the white flag about it. It is a means of assuring the forward move of the consumption of gas for lighting purposes, in view of the more economical gas-lamps on the market, and the frantic efforts of competitors to get a larger slice of the lighting business.

Novel Features in Gas-Meters.

Our "Register of Patents" frequently contains notices of new inventions in gas-meters; but mostly they are improvements in established parts for better securing common objects. These, however, show that ingenuity is not by any means exhausted in connection with gas-meter making, nor that the limits of perfection have been attained. Novelty in object is somewhat rare in these days in the means of registering gas consumption; but just lately there have been described and illustrated inventions which have about them what appears, relying only upon memory, to be originality in object and the means of attaining it. There is publication to-day of the outlines of an invention of American origin, standing in the name of Mr. Richard L. Dezendorf, which has for its purpose the provision of means for quickly indicating minute quantities of gas passing through meters. Now an invention of this kind may be claimed to be useful in two distinct ways. It ensures, it is understood, the registration of any consumption, however infinitesimal, and affords a means of quickly detecting leakage. In these days of small-consumption incandescent burners (a 1 foot per hour inverted may be the only burner alight for many hours in a house as a night light or for illumination over a desk), and of bye-pass jets not much bigger than a pin's head going throughout the twenty-four hours, it is a matter of consequence that meters should be equal to more sensitive registration than was formerly demanded of them. It is to be feared that these thread-like draughts of gas are not always accurately accounted for, and so go to swell the item of "unaccounted-for gas." In the detection, too, of leakage either at the time of fitting up a meter, or subsequently in the premises, an ordinary meter is not a prompt indicator; and considerable time may elapse before any record is made on the meter dial. To secure this high degree of accuracy in registration is the purpose of Mr. Dezendorf's invention; and, apart from usefulness, the simplicity of his small attachment, without introducing anything that can be called mechanical complication, is its charm, as can be seen by anyone interested by an examination of a model which we have at the office. The attachment is the only part that we have; and, not being incorporated in a meter, it is impossible to test the assertion that, by the invention the slightest flow produces a perceptible indication instantaneously. A meter of ordinary make supplemented by the means for such sensitive registration would, of course, offer facilities for making prompt determinations of many kinds.

Changing Prepayment Coins.

Another invention that was in mind when starting the above note was that of Mr. and Mrs. Stoneham (noticed a fortnight ago) for, in conjunction with prepayment meters, providing means for exchanging coins of low value for coins of higher denomination. The prepayment consumer often wants change; the slot gas-meter is charged with removing much of our bronze coinage from circulation; the collection and disposal of the pence from coin meters absorbs time and is costly; while banks vote the coin business a perfect nuisance. To give relief from these drawbacks, and to provide the prepayment user with the advantage of coin changing on the spot, are the directions in which Mr. and Mrs. Stoneham have been at work. Whether the invention will come into practical service is a matter upon which an opinion cannot be expressed just yet.

Gas-Works Rating.

This perennial subject of dissatisfaction and discomfort for the Directors and engineers of gas undertakings, and in the case of companies for the shareholders, was a chief point in the address of Mr. Alexander Dickson at the recent meeting of the Bromley and Crays Gas Company. The Company have just suffered an increase of their assessment; but not so great as the rating authority's valuer first sought to impose. The strictures to which expression was given by Mr. Dickson, had not so much reference to a reasonable advance of the assessment as to the new-fangled practices of valuers called in by the rating authorities, and the easy manner in which they step from the path that has been trodden for some thirty or forty years in respect of deductions and allowances. Mr. Dickson's opinion is that the matter is so grave that gas companies ought to make it one of common interest and consideration, and see whether something cannot jointly be done to prevent precedents being set at naught and new ideas introduced without judicial authority, and, further, see whether procedure cannot be simplified and systematized. The undesirability of the present condition of things is admitted, as is also the fact that procedure is in a state of remarkable confusion. What Sir George Livesey thought of the position of the rating of gas concerns was stated, in his usual vigorous style, at the meeting of the Gas Companies' Protection Association in October, 1907, on which occasion reference was made to a Committee to see whether a Bill could not be promoted to place the rating of gas-works on a more satisfactory footing. But the Ipswich decision a few months later removed one contentious phase; and thereafter the Association decided not to proceed in the matter then, but to wait and watch. We do not think, in view of all this, that any good would come from Mr. Dickson's suggestion of combined action. When the psychological moment arrives for doing something effective, depend upon it the Gas Companies' Protection Association will not miss it. That time, we fear, will not be until the whole subject of rating revision is under the consideration of Parliament.

Referring to the Livesey Memorial Fund in a recent issue, "Engineering Record" said: "It is gratifying to announce that the fund has been more than fully subscribed. As was mentioned at the time of his death, Sir George Livesey was not only a good engineer, but also a most capable executive. The class of labour employed in gas-works is ordinarily very rough. In the great plants with which he was connected, dissensions arose between the Directors and the men, which resulted in one of the most memorable of strikes in the history of British labour disputes. The settlement of it was an achievement that deserves to be kept in mind. It was not a mere temporary truce, but a readjustment of conditions which went down into the very heart of the trouble. As a result of it, the co-operation of the men and the Directors of the Companies over which Sir George Livesey presided remained complete down to the day of his death. The men became financially interested in the Companies, if they desired, and met the Directors on equal terms. The plan was ridiculed as impracticable for many years after it was put in operation; but it has proved a shining success for a full generation, and an enduring monument to the executive ability and tact of the engineer who introduced it. The Livesey Memorial Fund, which will be used in increasing our knowledge of gas engineering, will also, let us hope, keep alive the memory of this man who did so much to advance the status of engineers in the eyes of the public."

MEMORIAL TO SIR GEORGE LIVESEY.

The Livesey Memorial at the South Suburban Gas-Works, Lower Sydenham.

As an expression of their regard for the memory of Sir George Livesey and of their gratitude for the great benefit he conferred on them by the co-partnership system, the officers and workmen of the South Suburban Gas Company decided to erect a permanent memorial to him in the works, which should act as a continual reminder of their benefactor and friend, and should testify to succeeding generations of employees the high esteem and affection in which he was held by those who knew him.

It was decided that a bust should be placed somewhere near the entrance to the works, so that the men should see it every day as they passed in and out—to and from their employment. A site close to one of the gasholders on the main road through the works was selected; and the designing of the bust and pedestal and of an alcove to contain them was entrusted to Mr. Sydney March, of Glebe Place, Chelsea—a brother of Mr. Edward March, who has painted for the Directors a portrait of Sir George which now hangs in the board-room, and was exhibited in the theatre of the Institution of Mechanical Engineers during the meeting of the Institution of Gas Engineers last June.

The bust is of bronze, and is supported on an elegant stone pedestal, on which is a bronze tablet with the inscription—

SIR GEORGE LIVESEY,
CHAIRMAN 1894-1908.

On Friday last, the bust was unveiled by the Chairman of the Company, Mr. Charles Hunt, M.Inst.C.E., in the presence of the Directors, officers, and a large number of the workmen.

Mr. WILLIAM WALLER (one of the Workman-Directors and Chairman of the Memorial Committee), in opening the proceedings, said: Gentlemen and Co-Partners,—We are met here this afternoon to unveil the memorial which has been subscribed for by every co-partner in the Company, to show our gratitude and as a mark of respect for him we honour next to our King. There is one other way in which we can show our gratitude to Sir George; and that is by doing our duty to the utmost of our ability, so that other companies may be induced to adopt the co-partnership system. That will be the best possible memorial of the great man of whom we shall be daily reminded, by this bust, as we pass to and from our work. It now rests with us to make our co-partnership a lasting success; and I am sure that we shall do so. We are glad the mantle of Sir George has fallen on the shoulders of one so much after his own heart as our present Chairman, Mr. Hunt; and I will now ask him to unveil the memorial.

After unveiling the bust,

Mr. HUNT said: Mr. Waller and Co-Partners,—You will, I feel sure, agree that the bust which it has just been my privilege to unveil on your behalf does very great credit to the skill and fidelity of the artist, Mr. March, who, I am glad to see, is with us this morning. It recalls very vividly to our minds the features and the personality of our late friend; and it forms a fitting and worthy memorial of him. The position, also, which has been selected for it is, I venture to think, an ideal one; and here I trust it will long remain for all to see, and to testify to all who may come after, to your appreciation of the man and of his work. It is a tribute to the memory of one who, endowed with commanding capacity that must have brought him to the front in whatever walk of life he elected to follow, devoted himself to the service of the industry which he inherited, and of those among whom his lot had

After the Unveiling of the Livesey Bust.

Those represented in the group (reading from left to right) are: Sir Fortescue Flannery, Mr. S. Y. Shoubridge, Mr. George Ross, Mr. Robert Morton, Mr. Charles Hunt, Mr. Sydney March (the sculptor), Mr. Jabez Light, Mr. John Boraston, Mr Charles Carpenter, and Mr. William Waller.

The Workmen at the Inaugural Ceremony.

been cast. It is also a tribute to that clearness of vision which sighted the goal from afar; and to that undaunted courage and determination by which all obstacles to it were overcome. It is a tribute, moreover, to his personal magnetism, his transparent sincerity and steadfast friendship, his generous appreciation of honest effort, his readiness to do battle for the right, regardless of personal consequences, his desire to do to others as he would be done by, his freedom from ostentation, and his solicitude for both the material and the spiritual welfare of those around him. But above all, it is a tribute to the immensity of his services to the wage-earner, whether past, present, or to come. You, his contemporaries, have assisted in the making of history—in the inauguration and development of a great social movement, the growth and spread of which it is impossible to foresee. You may remember that Sir George Livesey was much impressed by an observation made by the great Italian patriot Mazzini, to the effect that workmen were originally serfs or slaves; that they then became wage-earners; and that they were destined to become proprietors. The fulfilment of this prediction has already commenced. In the course of a long administrative career, Sir George did much to ameliorate and improve the conditions of employment; but his establishment of the system of co-partnership was the crowning achievement of an arduous and eventful life. The position of the system to-day is one of greater strength and vitality than ever before, and is a monument to the memory of its founder, with which even "storied urn or animated bust" cannot compare. Sir George built, indeed, upon no insecure foundation when for the maintenance and success of the system he relied upon the hearty co-operation of the general body of those who were to participate in its advantages; and it is not the least of its merits that it has brought industrial peace—meaning that the energy which was formerly expended in efforts more or less antagonistic is now wholly directed to the common good. And it is for all these reasons that we are all here to-day to do honour to the name and the memory of George Livesey. It is because he was a true friend to his fellow-men, and served them greatly, that you have desired to perpetuate his memory; and this memorial which you have raised will be a constant reminder of the good he accomplished. Will it not also remind us of what it may be in our power to do, if only we use our opportunities as he used his?

Mr. Robert Morton then addressed the assembly. He remarked that he would like to say a great many things, but as the oldest member of the Board he would content himself by remarking that it was a great satisfaction to the Board to know that the idea of the memorial originated among the employees and had been carried through to such a successful conclusion entirely by them, without any assistance from the Board. The memorial which had just been unveiled would be a stimulus to them all to perpetuate the work which Sir George initiated and successfully carried on for so long.

Sir Fortescue Flannery, Mr. Jabez Light, Mr. John Boraston, Mr. Charles Carpenter, and Mr. George Ross (Directors) also addressed the meeting, after which Mr. S. Y. Shoubridge proposed, and Mr. Charles Ohren seconded, a vote

of thanks to Mr. Hunt for unveiling the memorial, and this was carried by acclamation.

Mr. Hunt, in replying, said the Board had under consideration the question of providing a new building for the use of the employees, in place of the present recreation room; and it was proposed to call this the "Livesey Memorial Hall." It would comprise a hall suitable for meetings, concerts, &c., capable of seating about 450 persons, a billiard room for three tables, reading rooms, and refreshment rooms, &c.; and adjoining it there would be a bowling green. The Engineer had already submitted the plans to the Board, and the employees would have an opportunity of seeing them. If they had any suggestion to make, and would communicate with the Workman-Directors or the Engineer, they would be considered before the plans were finally approved.

A vote of thanks to Mr. Waller and the Memorial Committee closed the proceedings.

"METALLIC FILAMENT" GAS-MANTLES.

There is some promise that the term "metallic filament" will soon be as applicable to gas-mantles as to electric incandescent lamps, with the difference that whereas the metallic filament electric lamp is very fragile, the metallic filaments of the new gas mantles are peculiarly strong individually, and their interlacing in forming the fine mesh gives strength and power of resistance. The new mantles are the invention of Herr H. Reeser; and his patent specification was the subject of notice in the "Journal" for April 13 last. He is not the first inventor to essay to make mantles from finely drawn wire. Platinum has been used; and alloys of various kinds have been tried, but the low illuminating efficiency of the latter and rapid corrosion have done their work in destroying the hopes of the inventors. But Herr Reeser assures us that he has done better; and a sample of the wire-woven material that he has introduced to us induces at once an inclination to share his hope. In a short time, we shall have an opportunity of putting the invention to a test for confirmation. Herr Reeser uses a mixture of metals—silver being one of the principal constituents; and the wire produced looks like a thread of silk, being only 5-100ths of a millimetre in diameter. This is woven into a fine mesh; and then it is subjected to a process whereby a deposit of molybdenum is formed on it. The mantles both for upright burners and inverted are only 1¼ inches in length from top to bottom; and a special burner is used with them—seeing that the mixture of air and gas that has been found to be best approximates three volumes of the former to one of the latter. By means of special construction, the flow of the mixture is accelerated. Now there is a peculiar feature of this new mantle, in that the flame does not burn inside the mantle; but, being wire, combustion takes place on the surface of the mantle. The flame, however, is not perceptible; all that can be seen is the incandescent mantle—every filament in the mesh presenting the same appearance as the filaments of the new tungsten lamps of the electrical industry. Another point is that, by varying the constitution of the filaments, the inventor informs us that he can get any coloured light required. The mantles are not costly to make; so that they will be sold, when placed on the market, for quite a moderate sum. The efficiency is stated by the inventor to be high—85 candles for 2 cubic feet of gas per hour, at 1½ inches pressure. The useful life of the mantle is put at no less than 2000 hours, though there is a little depreciation after 1200 hours. But through life, the mantle is said to retain a good shape. Herr Reeser has been at work trying to produce a serviceable metallic filament mantle since 1895; and he is now perfectly satisfied with the success. His perseverance deserves reward. When there has been an opportunity of trying the new mantle, we shall have something more to say at first hand about our experience with it. This preliminary announcement will, we think, prove interesting to our readers.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 525.)

Quietness was hardly the word to describe business on the Stock Exchange last week; for on one or two days absolute stagnation would be nearer the mark. Some exception may be taken to this view in relation to one market—the American; but that moves in exceptional lines which it is not our province to follow. To add to the slackness, the Exchange was closed on Saturday; thus reducing the period of possibility of action. The opening day gave indication of what was to come in point of quietude; and there was a general tendency in prices to droop from sheer inanition. Railways were dull, and the Foreign Market stagnant. Consols were, however, in favour, and advanced ⅛. Again on Tuesday movements were almost lifeless—except for American operations. Everything was dull, if it had any feature at all, and Consols fell with the rest. The weakness continued on Wednesday. Even the speculative departments were very quiet; but some Foreign Government issues were strong. Thursday brought a small degree of improvement. Home Government securities were quite good, and Consols picked up $\frac{1}{16}$. But Railways remained shaky, and there was a smart American reaction. Friday was a bad day. Railways were depressed by the weather and some other adverse factors; and the dulness was more or less felt in almost all markets. In the Money Market, there was hardly any change in rates for short loans, the supply being abundant; but discount grew gradually harder until nearly the close. In the Gas Market, the shortage of business was to some extent felt in common with other departments; but the tendency was firm, and good things commanded good figures. Reports and accounts for the past half year to hand during the week confirmed previous indications that that period has been a good one for the industry, and some further increases in dividend are announced. In Gaslight and Coke issues, the ordinary was fairly busy and quite steady, transactions marking from 104 to 105. The secured issues were quiet; the maximum changing hands at 87½ and 88, the preference at 103¼ and 103¾, and the debenture at 86 and 86½. South Metropolitan was very quiet at from 119 to 120; but the debenture was active at from 84¾ to 85½. Little was done in Commercials. The 4 per cent. realized 110, and the 3½ per cent. 106½. Among the Suburban and Provincial group, Brentford old was done at 250 and 252, ditto new at 191, Brighton original at 214, and West Ham at 124½ and 125. The preference and debenture of the last named had a further rise. The Continental companies were quiet. Imperial marked from 179½ to 180½, ditto debenture 96 (a rise of 1), Union 96 and 97—a fall of 1. Both Europeans advanced. Among the gas undertakings of the remoter world, Buenos Ayres fetched 13⅞, Monte Video 12⅞, Primitiva from 7 to 7$\frac{1}{16}$, ditto preference 5⅝, ditto debenture 94½, and River Plate from 16$\frac{13}{16}$ to 17.

ELECTRICITY SUPPLY MEMORANDA.

The "Electrical Contractor's" "Must"—Municipal Trading in Wiring and Fittings: A Test Case Proposed—Electrical Contractors and Private Generation—Vulgarity—Transformation Losses—A Terrible Disaster and Minor Occurrences.

The Electrical Contractors' Association, with the House of Lords on their side and the House of Commons and the Government in opposition to them, have become a little assertive in tone in their monthly periodical. That the House of Lords are temporarily allowing the Association the distinction of their friendship should not cause the latter to lose their heads. The Electric Lighting Acts (Amendment) Bill, as our readers have been made aware, contains a clause empowering local authorities to enter upon the electric wiring and fitting business, providing it is run on lines that will cause income to cover outgoings in connection with it. The agitation of the Electrical Contractors' Association (upon their perseverance in which we congratulate them) attained its objective when Lord Avebury, the sworn foe of municipal trading, induced the House of Lords to insert in the clause giving permissive power to trade in fittings and appliances, the qualifying words "through a contractor, but not otherwise." The sweets of victory were not to be long enjoyed; for when the Bill reached Standing Committee "C" of the House of Commons, out came the words offensive to municipal electricity suppliers, although it was recognized by Mr. Tennant, the Parliamentary Secretary to the Board of Trade, that there might be a little difficulty with the Lords over the subject. It seems that the Electrical Contractors' Association have condescendingly expressed their willingness to compromise, by giving the municipalities the power to let on hire cooking appliances and the like, but the execution of the rest of the work connected with installations of any kind is to pass through no other channel but that of the local contractors. The municipalities have rejected the Association's advances. Under these circumstances, the Association say the Avebury amendment "must be" re-established or the clause must go. This is their ultimatum to the Government, the House of Commons, and the local authorities of the country. The power of such absolute decision must be a fine feeling. We have never tasted it in such a matter, so we do not know. According to the organ of the Association when the amendment was under consideration by Committee "C" "insane remarks" were made by members and "inane words" fell from the lips of one of these public men. That is not the way to coax those in authority into a different line of thought and action over the matter.

Turning to an earlier part of the same periodical, it is seen that the members of the Association are being canvassed for money guarantees, in order that a test case may be instituted to ascertain the legality of municipal electrical contracting upon isolated installations without special parliamentary authority. Being an incorporated Association, we suppose that champerty possesses no fears for the members. However, having just been reading of "insane remarks" and "inane words," it is interesting to observe in the editorial note on this matter that "particulars of innumerable cases have been received, some of the most 'fragrant' [*sic*] character; and Counsel has advised the Law and Parliamentary Committee that corporations have no such powers, and that an action would be likely to be successful."

Municipal trading in this manner, being responsible for making vast inroads in electrical contractors' profits, why should not the latter retaliate by showing the large customers of the municipal electricity undertakings how they can get electricity at a lower cost by having their own private generating plants than the price at which the local authority will supply energy to them. The

supply of these plants means profit; and their after-maintenance will bring grist to the contractor's mill. If the installation is not complicated by a suction-gas plant—which needs time in starting up, does not afford a constant quality of gas, and produces dirty valves and other unpleasantness—but the engine is fed with the clean and ever-ready gas of the town supply, there will be little trouble and very considerable gain to the electricity user. The recent action in which the lessee of the Worthing Theatre Royal was the plaintiff, and a local firm of electrical contractors the defendants, indicates that there is profitable work to be done in this direction. It was a claim for damages for negligent installation; the plant consisting of a "National" gas-engine, suction-gas plant, and dynamo. It appeared that in this case there had been no trouble prior to the machinery being placed under the care of an attendant who could neither read nor write. Mr. Justice Bucknill, after a trial lasting several days, attributed the troubles that had arisen entirely to the carelessness of the attendant; and what was more he refused leave to appeal. Had the engine been supplied with town gas, we very much doubt if even the illiterate attendant would not have scraped through without trouble.

One further reference to the "Electrical Contractor." When in argument, there is no need to drop into vulgarity. A paragraph in the August issue is headed "More Gas Lies." The Wandsworth and Putney Gas Company are accused of being the circulators of the particular alleged untruths that have angered our monthly contemporary into giving vent to a little abuse. The Company, in their circular, compare gas at 2s. per 1000 cubic feet with electricity at 6d. per unit. This is not an unusual price for lighting units; and the Wandsworth Company supply gas for lighting at 1s. 11d. per 1000 cubic feet. Then the "Contractor" appears to doubt, but is afraid to positively say it is not the case, that 50-candle power incandescent gas-burners can be obtained which consume only 2 cubic feet per hour each. There are several inverted incandescent gas-burners on the market that will return an efficiency of 25 candles per cubic foot; and there is no question that the Wandsworth Company will be quite prepared to prove this, photometrically and by test-meter, to the Editor of our contemporary if he desires it. The Company take in their comparison the commonly used carbon filament electric lamp, using 4 watts per candle-hour during its life. There is no "lie" about that being a fair average consumption during the life of a carbon filament lamp. In 1500 hours a 50-candle power inverted incandescent lamp, using 2 cubic feet of gas an hour, will consume 3000 cubic feet of gas, which at 2s. represents 6s.; at 1s. 11d. (the current price), 5s. 9d. A 50-candle power carbon filament lamp will use 200 watts an hour; and therefore a unit of electricity would be registered by five hours' use of the lamp, and 300 units by 1500 hours' use. 300 units at 6d. work out to £7 10s. Where is the "lie" there? and where is the common sense about our contemporary's complaint? If a 50-candle metallic lamp is used for 1500 hours, it will consume 93 units of electricity at 1·25 watts per candle; and 93 units at 6d. will work out to £2 6s. 6d. Is there a "lie" about that?

A short article has appeared in the "Electrical Review" having for its intent proof that the attention now being given by manufacturers and others to the design of a reliable automatic switch to save the no-load losses in small transformers is practically valueless labour. The scope of application for these auto-switches is very limited—in fact, the writer has a doubt in his mind as to whether there would be any real benefit even to users of transformers up to 1 kilowatt an hour. The losses in this size are about 20 per cent. of the full-load current—that is, 10 watts on the 500-watt size; this being the size of the majority of transformers for house and small shop lighting. Taking the average lighting hours as 4½ per day, this would give 19½ hours loss per day of 10 watts = 195 watt-hours. This represents 71 units per annum, which, at 4d. per unit, would cost 23s. approximately. By spending more money on the original cost of the transformer for a better quality of iron, this loss may be reduced by 40 per cent., or to about 14s. The cost of the 500-watt transformer is somewhere in the neighbourhood of £2; so that an extra 10s. or 15s. or so is not a great item to pay for the better iron and lower loss. The cost of the auto-switches at present on the market is about £3 each. Therefore, by using a £3 switch, 14s. per annum can be saved on a bill amounting to (say) £6 or £7 after 4¼ years, which time is wanted to pay for the switch! All these savings and calculations, however, are based on the assumption of perfect working of an automatic device, which, unfortunately, is rather a rarity in practice. This significant remark is found towards the close of the article: "The metal filament lamp is quite delicate enough, without adding to our present many chances of failure." The article is useful, as it gives electrical testimony—not our own—as to the cost (including the electrical losses) of transformation for metallic filaments.

The danger of allowing wires conveying high-tension current to cross, or to be in proximity with, wires conveying current for lighting purposes, has had deplorable illustration in the catastrophe that has brought severe mourning to the Italian village of Olginate, near Lake Como. During a thunderstorm last Wednesday, the high-tension wires from the power-house were broken, and, in falling, they came into contact with the wires carrying the current for electric lighting. According to the reports to hand, a "short-circuit" was produced in every house. Instinctively there was a rush in the houses to switch-off the current to prevent the danger of fire. Every house in which there was electricity was for the time being a death-trap. Twelve people were killed; and twenty-nine received severe shocks and burns. Wires caught fire and fell from the walls, on to the terrified occupants of the rooms. All the lights were extinguished; and the darkness intensified the terror of the people. Life in the village has since been paralyzed by the terrible occurrence. The art of the engineer is to direct the great sources of power in Nature for the use and convenience of man; but, as the event proved, the work, if we may depend on the reports, was not well directed in this instance, or there would have been no possibility of contact in the event of an accident to the high-tension wires.

Round about Portsmouth, there have been some terrible panics through the fusing of electric wires. Some time ago a huge toy bazaar was reduced to ashes; and the conflagration started and got a big hold of the flimsy goods while the place was packed with Christmas customers—mostly ladies and children. Now at the Victoria Hall at Southsea, the fusing of a wire in a cinematograph apparatus, causing a film to momentarily flare up, created such alarm among the children who principally constituted the audience that there was a wild rush to the doors. In the panic, one little fellow lost his life, and eight other children were severely injured. As it happened, there was no occasion for the rush; but women and children are easily scared. Fortunately, the Barnsley catastrophe was not repeated in this instance. It is evident that, with the uncertainties of electricity and the ease with which cinematograph films will fire, some better means ought to be taken for preventing panics at entertainments of this kind.

On the same day that there was this lamentable trouble at Southsea, Bermondsey had a little excitement of its own through the capability of electrical distribution systems to generate their own gas, ignite it, and cause explosions that create, according to the veracious daily news recorders, "considerable alarm." Distributed town's gas falls far short of any glory that may attach to the ability to complete this cycle of operations within its own distribution system. The gas must escape from the pipes before an explosive mixture can be formed, and a light must be applied before there can be an explosion. The necessary air is waiting in the electrical culvert for the generation of gas from the insulating material; and the cable furnishes the igniting spark. Thus the whole thing is complete; and thus the lids of two pavement boxes and about a dozen paving-stones round each, were sent flying into the air at Bermondsey without any preliminary notice whatever. The interiors of the boxes were fractured and the cables injured. Two boxes opposite the Law Courts in the Strand were testifying to the ability of electricity in the same way only the other Sunday. That such things should be, does not improve one's confidence in the safety of the footways of our streets. Not only in the streets but in buildings, electricity has been busy lately asserting its destructiveness. One example has been at the General Electric Company's Works at Witton. Greater respect is surely due to the Company from electricity. The seat of the fire was behind a switchboard in the testing department. The origin of a fire at the British Alcohol Company's works at Canning Town last Thursday is attributed to the fusing of a wire; but the inflammable nature of the contents of the building caused a small beginning to end in costly disaster.

The Lime-Nitrogen Industry.—The annual report of the General Company for Cyanamide in Rome gives some interesting information about this modern industry. The manufacture of this fertilizer is going on at six places, in addition to which a new Company has been started in Bavaria, while others are in course of formation. Last year two sale bureaus were erected—one for Northern Europe, domiciled in Berlin, and comprising Germany, the Netherlands, Denmark, and Finland, and the other one for Southern Europe, domiciled in Paris, comprising France, Switzerland, Spain, and Portugal. During the months of January and February, 26,000 cwt. were sold in Germany and 5000 cwt. in France. The information from the large installation at Odde, in Norway, appears to be encouraging; at the East German works the annual production is calculated at 2500 tons; while the capacity of the first works of the American Cyanamide Company, on the Canadian shore of the Niagara, is 5000 tons a year. A Japanese Company has been formed in Tokio; and preparatory work is going on in India, Canada, and South Africa.

Prizes of the Société Technique for Next Year.—The "Journal des Usines à Gaz" for the 5th inst. contains full particulars in regard to the prizes offered by the Société Technique in connection with next year's congress. At the head of the subjects stand the small domestic gas-engine and the various uses of gas for lighting with or without high-pressure. The other subjects include appliances for the manufacture or utilization of gas, incandescent gas-burners, apparatus for lighting gas-burners at a distance, for the domestic use of gas, for the industrial and domestic use of coke, and generators for the production of poor or water gas by the utilization of gas-works coke. The prizes are of the maximum value of 10,000 frs., 8000 frs., and 5000 frs., according to the subject, and they are awarded at the general meeting of the Society in June. They are open to the competition of anybody, whether a member of the Society or not. As usual, prizes will be awarded for the best papers submitted at the meeting next year. Any further information on the subject can be obtained on application to the Secretary of the Society, M. Payet, No. 94, Rue St. Lazare, Paris.

PERSONAL.

Mr. William Rogerson, of Reading, has been appointed Manager of the Bollington Gas-Works, in succession to the late Mr. H. Froggatt, whose death occurred a few weeks ago. There were 25 applicants for the post, the salary attached to which is £2 2s. per week. The engagement is terminable by a month's notice on either side.

As will be gathered from the report of the proceedings elsewhere, the proprietors of the Croydon Gas Company were gratified at their meeting on Friday to learn from their Chairman (Mr. Charles Hussey, J.P.) of the honour that had been conferred upon Mr. James W. Helps, the Engineer and General Manager, in his election as President of the Institution of Gas Engineers. From several quarters, the President was warmly complimented.

OBITUARY.

Reference has already been made to the illness of Mr. T. J. Cotton, the Gas Examiner to the Corporation of Dublin, and to the appointment of his son, Mr. Henry J. Cotton, to temporarily discharge his duties. We regret to record that the illness has terminated fatally.

The death occurred very suddenly early last Friday morning of Mr. David Jones, the Manager of the Dowlais Gas-Works. Deceased went to Dowlais forty years ago, and was for ten years employed at the steel-works. He entered the Gas Company's service as Secretary, and afterwards became Manager. He was on the Council of the Wales and Monmouthshire District Institution of Gas Engineers and Managers. Mr. Jones was in his 60th year, and he leaves a widow, four sons, and four daughters.

The death occurred early last Wednesday morning, at the advanced age of 93, of Sir Theodore Martin, the Chairman of the Brymbo Water Company. Deceased was a distinguished member of the Parliamentary Bar; and a fitting tribute to his ability was paid before a Select Committee of the House of Commons in the course of the day by Mr. Balfour Browne, K.C. Sir Theodore was senior partner in the firm of Messrs. Martin and Leslie; and took part in the business almost to the end of his days. He was also a literary man, and was the author of "The Life of the Prince Consort."

The current number of the "Journal des Usines à Gaz" contains a notice of the life-work of the late M. Emile Camus, who for 45 years took a prominent part in the management of the old Paris Gas Company. The deceased gentleman, who was in his 88th year, entered the service of the Company in 1861, under M. de Gayffier, the General Manager; and he eventually took the leading position in the administration of its affairs. He conscientiously fulfilled all the engagements entered into by the Company under their concession; and upon the occasion of his funeral at Père Lachaise, M. Sauton, who had been the most energetic defender of the interests of the City in the Municipal Council, rendered to his loyal opponent and to Madame Camus the testimony of his respectful consideration.

The German Gas-Mantle and Electric Lamp Taxes.

Reference was made in the "Journal" for the 10th inst. (p. 390) to the taxes on incandescent mantles and electric lamps which come into operation in Germany on the 1st of October. The taxation applies to all electric glow lamps and burners, to incandescent mantles for gas, spirit, petroleum, or similar incandescent lighting, to carbons for electric arc lamps, and to mercury vapour and similar electric lamps. The scale of taxation for electric glow lamps with carbon filaments is 0·6d. per lamp up to 15 watts, 1·2d. from 15 to 25 watts, 2·4d. from 25 to 60 watts, 3·6d. from 60 to 100 watts, and 6d. from 100 to 200 watts. Metallic filament lamps, Nernst lamps, and other glow lamps not having carbon filaments are taxed at double the foregoing rates. Above 200 watts the tax increases at the rate of 3d. per 100 watts for carbon filament lamps, and of 4·8d. for other lamps. Mantles for incandescent gas or similar burners are taxed uniformly at the rate of 1·2d. per mantle. Carbons for electric arc lamps are taxed at the rate of 3¼d. per pound if of simple carbon, and at the rate of 5·4d. per pound if of treated carbon for flame arc lighting. Mercury vapour and similar lamps pay at the rate of 1s. per 100 watts. The whole of these taxes apply only to lamps and mantles for use in Germany, and not to exports. It will be seen from the foregoing scale that the incidence of the new tax is relatively far heavier on gas consumers than on users of the electric light.

Electrolysis of water-mains at Winnipeg has been investigated by Professor L. A. Herdt, of the M'Gill University, who reports that the soil there has a very low electric resistance, and only a very small difference of potential can be allowed in rail-returns. He states that all bonds of which the resistance is greater than that of 4½ feet of rail must be improved, and insulated feeders substituted for ground plates at the sides of bridges to carry the current across the river.

TEN YEARS' PROGRESS OF GAS UNDERTAKINGS.

By G. M. Gill.

A comparison of "Field's Analyses" for the years 1898 and 1908 shows in a striking manner the progress made by gas undertakings during a period which has been one of strenuous competition. It speaks well for the stability of the gas industry that it has not only been able to withstand the attacks of its competitors, but has been able to forge ahead into territories which, years ago, were deemed impenetrable. Especially is this the case with the remarkable popularity of the slot-meter, which has enabled gas undertakings to broaden the base upon which the future prosperity of the gas industry so entirely depends. How much this development has progressed is shown by the fact that the number of consumers has increased out of all proportion to the quantity of gas consumed. That disadvantages arise from this state of affairs is undoubtedly true. This is particularly noticeable in the direction of increases in capital indebtedness and the cost of distribution; but, in spite of the extra demand on capital, it is satisfactory to note that the capital employed per 1000 cubic feet of gas sold shows a reduction as a result of ten years' working. For the purpose of these comparisons, the figures of the Metropolitan, Suburban, and Provincial gas companies are taken as instances to show the general trend and progressive nature of the gas industry in England during the period stated.

Capital Employed per Thousand Feet Sold.

In this respect the average of the companies shows a reduction from 10s. 9d. to 10s. 5d., or, in other words, from £537 to £520 per million cubic feet sold. Without being substantial, it must certainly be considered satisfactory, especially when it is borne in mind that the requirements of recent years have necessitated large outlays of capital. The tendency of recent years has been to introduce machinery and increase the amount of capital employed with a view to saving large sums hitherto expended on labour. And not only in this direction has there been a demand for increased capital; the installation of slot-meters, with the attendant expense of fitting new services for a comparatively small return, has cost large sums of money which in past years it has not been necessary to expend. Another factor tending in the same direction is the greatly increased cost of modern retort-house installations. With elaborate regenerative settings, stoking machinery, stage floors, coke-conveyors, and coke screening plants, it is easy to exceed several times over per million of output the cost of simple direct-fired settings with none of the appliances of modern experience. It speaks well for those responsible for the administration of the companies concerned that the capital employed per 1000 cubic feet has been actually reduced. To mention one typical instance, the Commercial Gas Company in 1898 had 32,701 consumers, using, on an average, 69,547 cubic feet of gas per annum. In 1908, the consumers had increased to 91,690, or nearly three times greater, with a corresponding consumption of 33,251 cubic feet, although the total amount of gas sold had only increased by 30 per cent.—*i.e.*, from 2,401,209 to 3,123,155 cubic feet per annum. In the same period, in spite of this enormous increase in the number of slot-meter installations, the capital employed per 1000 cubic feet sold has only risen the moderate amount of 6d. per 1000 cubic feet—from 8s. 8d. to 9s. 2d. This is a case in which the bulk of the development in slot-meter installations has been compressed into the short period of a few years only; and it is not surprising that, in similar cases, where there has been no large increase in gas sales, there should have been a fairly substantial increase in capital indebtedness.

Capital Charges per Thousand Feet Sold.

The capital charges per 1000 cubic feet of gas sold show a satisfactory reduction from 9·8d. to 8·7d.—an improvement considerably greater than the reduction in the "capital employed." At first sight, this would appear anomalous; but it is undoubtedly chiefly attributable to the infinitely better financial policy brought about by the action of the auction clauses in the raising of capital. It will be remembered that these clauses, introduced in the year 1877, stipulate that, in raising additional capital, provision must be made for the offer of such capital by public auction or tender at the best price which can be obtained. Before the auction clauses came into force, the shareholders benefited at the expense of the general prosperity of the companies in which their capital was invested. To take a case in point, one company shows, under the heading of capital employed per 1000 cubic feet of gas sold, 10s. 9d. in 1898 and 12s. 8d. in 1908; but under capital charges, 9·13d. in 1898 and 8·74d. in 1908. Thus, in 1898 7·25 per cent. interest and dividend was being paid on 10s. 9d. of capital, and in 1908 only 6·01 per cent. was being paid on 12s. 8d.—showing plainly that since 1898 capital has been raised on cheaper terms, and has not, as in the past, been given away in the shape of premiums to existing shareholders. As further proof of the value of these clauses, it is noticed that while in 1898 an average of 8·02 per cent. was being paid on the capital employed, in 1908 this had been reduced to 7·09 per cent. It should be pointed out that this is a substantial reduction when the proportion (obviously small) of capital raised since 1898 compared with that raised before that time is taken into consideration.

Price of Gas.

In respect of the price of gas, the progress made has not been so substantial as might have been expected. The average price

of the Metropolitan, Suburban, and Provincial companies has been reduced from 2s. 7·6d. to 2s. 6·5d.—a reduction which should have alone been brought about by the decrease in the capital charges per 1000 cubic feet. In this connection, a counteracting influence should be mentioned.

Distribution Developments.

The reference is to the enormous increase in the number of consumers, amounting to 105 per cent., and the much smaller increase of 29 per cent. in the quantity of gas sold. This has naturally resulted in a smaller sale per consumer; the average quantity having dropped from 51,886 to 33,361 cubic feet—a reduction which has increased the cost of distribution to a considerable extent. It should, however, be mentioned that, if the gas supplied by the Gaslight and Coke Company is excluded, the actual increase in the consumption from 1898 to 1908 has amounted to nearly 49 per cent. The reduction in the average consumption is, of course, chiefly accounted for by the fact that slot-meter users, of which there are now so large a proportion, only consume some 10,000 cubic feet per annum; and as in the case of some companies the number of slot-meters actually exceeds the number of ordinary meters, it is not surprising that the average consumption has substantially decreased. Again, this is partly due to the greatly increasing number of users of incandescent burners, who have been able to brighten their homes at a greatly reduced consumption of gas.

The enormous increase of 105 per cent. in the number of consumers in a period of ten years is proof of the fact that the gas industry has been placed on a much broader basis, which is of itself a matter of great importance, increasing in no small degree the stability of the capital employed in the industry. The extra attention which consumers now receive is well illustrated by the additional expense allotted under the heading of distribution. This item includes salaries and wages, wear and tear of mains and services, and meter and stove repairs. In 1898 distribution only amounted to 3·02d.; whereas now it costs 5·08d. It would appear as though the reduction from 51,886 to 33,361 cubic feet in the quantity of gas used has a counterpart in the increase of about the same proportion in the cost of this work.

Cost of Coal and Oil.

This item has increased from 14·12d. to 16·18d. per 1000 cubic feet. The increase would have been considerably larger were it not for the fairly general rise in the make of gas per ton of coal, and the replacement of a certain amount of coal by oil for the manufacture of carburetted water gas, which is now used in much greater proportion than it was ten years ago.

Carbonizing Wages.

So much attention has been paid to the working of stoking machinery, and so much has been done to develop to the full its possibilities during the past few years, that it is not surprising to find that there has been an average saving from 3·62d. per 1000 cubic feet in 1898 to 2·27d. in 1908. Some credit must, however, be given to the effect of the more general adoption of water-gas plant, which would, of course, have the result of reducing this figure. Taking into consideration the extensive development in the introduction of machinery, it is satisfactory to notice that the cost of wear and tear is almost identical in the two years 1898 and 1908. In the former years it was 3·62d., as against 3·69d. in the latter.

Purification.

This is now being carried on with considerable economy at a cost of 0·40d. per 1000 cubic feet, compared with 0·74d. in 1898; and it is noticed that if the Metropolitan and Suburban companies figures are taken separately from those in the Provinces, there is the substantial fall from 0·80d. to 0·31d. in the cost of this work. In spite of this notable reduction in cost, it is highly satisfactory that there have been, as was confidently anticipated, no complaints of any kind on the part of consumers in districts where purification from sulphur compounds has been abolished.

Rates and Taxes.

Rates and taxes show a small increase from 1·73d. in 1898 to 1·79d. in 1908. Without in any way depending on the amount of the net profit of a company, it is unsatisfactory that the proportion appropriated in this way, as compared with the net profit, continues to increase. Thus the ratio of the rates and taxes to the net profit, as represented by the capital charges, has risen from 17·6 per cent. in 1898 to 20·5 per cent. in 1908.

Residuals.

Very little difference is noticed in respect of residuals.

Coke.—The quantity of coke made for sale is exactly the same at 9·32 cwt. per ton of coal in the two years under comparison. This is disappointing, as an increase might well have been expected, taking into consideration the almost general adoption of gaseous firing of recent years, and its consequent economy in fuel consumption,. The lack of improvement may be distinctly traced to the extra breakage of coke resulting from the use of discharging machinery, particularly the now obsolete drawing machine, and the evil of a long drop for the coke necessitated by all stage-floor houses, except those in which coke-conveyors have been installed; and in these cases it is a matter for doubt whether the breakage of coke is not accentuated to an even greater degree by their use. There is good reason for suggesting that the disappointing figures in connection with coke production are due to mechanical appliances of one sort or another. That this is so is shown by the fact that the revenue from the sale of breeze has increased from 0·14d. per 1000 cubic feet in 1898 to 0·25d. in 1908—due to the large quantity now made and sold per ton of coal carbonized. This is especially the case with the Metropolitan Companies. In 1898, the revenue from breeze was 0·18d. per 1000 cubic feet; now it is 0·39d., or over double as much. The terms "hand-made" and "machine-made" coke are familiar enough to suggest that a great deal more attention should be paid to the careful handling of this product. In the matter of revenue from coke sales in 1898, the average was 5·29d. per 1000 cubic feet sold; while in 1908 it was 6·08d.

Tar.—This bye-product, with its valuable constituents, shows some slight improvement in price per gallon during the period of ten years. In 1908, the companies concerned in this comparison sold their tar at an average price of 1·14d. per gallon, as against 1·10d. in 1898. But if the figures per 1000 cubic feet sold are taken, it is found that the revenue from tar amounted to 1·13d. in 1898, compared with 0·99d. in 1908. This decrease is partly accounted for by the smaller production of tar per ton of coal. In 1898, this was 10·7 gallons; while in 1908 it had fallen to 10·1 gallons. Further, an increase in the proportion of water gas made would have a similar effect.

Ammonia.—In this respect, the average receipts have increased from 1·35d. per 1000 cubic feet in 1898 to 1·69d. in 1908. The satisfactory state of the market in this artificial fertilizer is fairly attributed to the efforts of the Sulphate of Ammonia Association and the successful way in which they have brought the valuable properties of this manure before the notice of users.

Meter and Stove Rental.

It will be noticed that the items of meter and stove rental have increased considerably. It is the natural outcome of a smaller output per meter and greater development in cooking stoves.

Conclusion.

Though only the main items have been under consideration, it will be noticed that the reduction in the average price of gas in the period of ten years tallies very closely with the difference in the main items included in the table. The reductions in wages and purification and in capital charges are particularly satisfactory; and the same may be said of the charge for wear and tear, taking into consideration the various factors which would tend to increase this item. Of the remaining figures, it will be seen that the increase in the returns from residuals pays for rather more than half the extra cost of coal; while the increased returns from meter and stove rental goes a long way towards counterbalancing larger expenditure on distribution. Though the progress shown, as represented by the price of gas is not very great, it may yet be confidently asserted that much has been done to pave the way towards a prosperous future, especially in the modernizing of works and in the attention given to consumers in recent years.

Expenses—Pence per Thousand Cubic Feet Sold.

	1898.		1908.
Coal, including oil and spirit	14·12	..	16·18
Carbonizing wages	3·62	..	2·27
Purification	0·74	..	0·40
Wear and tear	3·62	..	3·69
Distribution	3·02	..	5·08
Rates and taxes	1·73	..	1·79
Capital charges	9·80	..	8·70
	36·65	..	38·11
Receipts.			
Coke	5·29	..	6·08
Breeze	0·14	..	0·25
Tar	1·13	..	0·99
Ammonia	1·35	..	1·69
	7·91	..	9·01
Meter rental	0·88	..	1·39
Stove ,,	0·46	..	1·46
	9·25	..	11·86
Deduct receipts from expenses	= 27·40	..	26·25

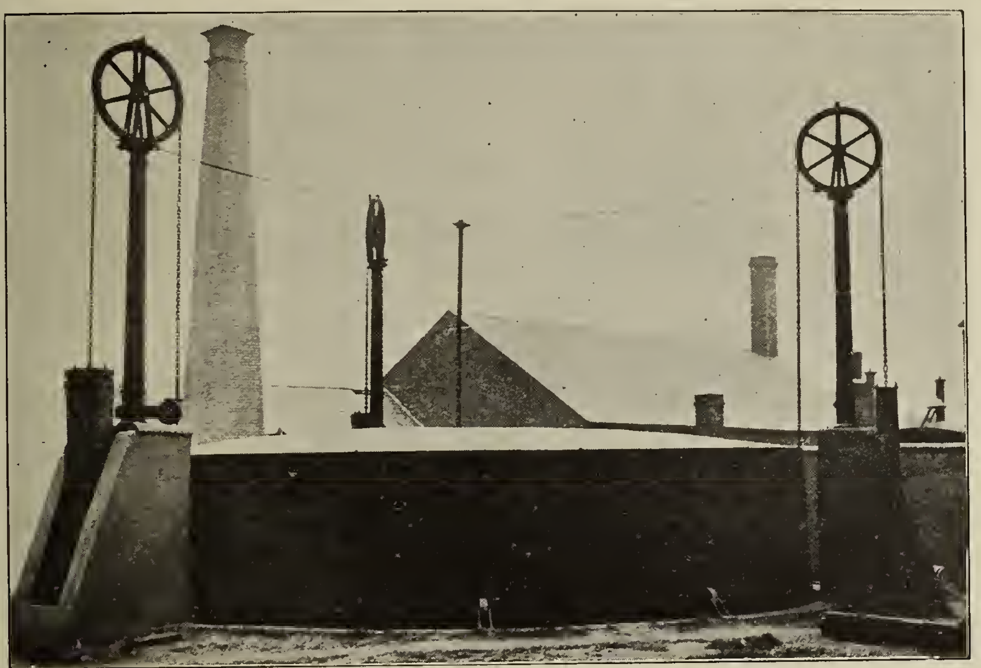
A saving of 1·15d. per 1000 cubic feet.

Oxy-Acetylene Blowpipe.—In the "Notes on Gas Lighting" in a recent number of the "Ironmonger," reference was made to an interesting account given in the "Revue des Eclairages" of a new installation of the oxy-acetylene blowpipe carried out in Bucharest by the Société Italo-Roumaine. The factory contains plant for the manufacture of oxygen by the Linde process, low-pressure acetylene for illumination, compressors for supplying dissolved acetylene, and, finally, an equipment for demonstrating acetylene welding with both the Fouché and the Cyclops blowpipes. The Linde oxygen plant can deal with nearly 8500 cubic feet of air in 24 hours. No use having been found for the nitrogen, it is allowed to escape; but the oxygen is stored in a gasholder, from which it is withdrawn for compression. Our contemporary says: "It is interesting to note that the authorities seem quite converted to the use of acetylene; the management of the railways having decided to introduce autogenous welding into the workshops, while the Minister of Public Works is having experiments made with dissolved acetylene as a means of illumination for the buoys and floating lights on the Danube."

AN INTERESTING RELIC OF MURDOCH.

Last Tuesday was a memorable day in the history of Birmingham, for it was the centenary of the death, at the age of 81, of Matthew Boulton, whose name, in association with that of his partner James Watt, figures so conspicuously in the commercial history of the capital of the Midlands, and whose life-work contributed so largely to its prosperity. Boulton was the son of fairly well-to-do parents; and this fact and a fortunate matrimonial alliance enabled him to start the world-renowned Soho Foundry. It has been proposed that something should be done in the way of honouring the name of Boulton. One proposal is the establishment of a scholarship in Mechanical Engineering for the Technical School at Handsworth (where he was buried) to the Birmingham University; and another is the erection, in front of the Handsworth Council House, of a statue of Boulton, very possibly to be followed by others of his partner and his partner's right-hand man—William Murdoch. We venture to think that the three men are well worthy of this recognition. Boulton was no inventor; but he had the money. The Soho Foundry—begun in 1775 and started early in 1776—had £40,000 sunk in it before any profit was earned. Watt had the inventive faculty, but he was incompetent in commercial affairs. Three years after the works were started a man called there in search of employment; and he obtained it. It was Murdoch—the man who will be associated with gas lighting as long as the world endures.

It is unnecessary to deal at length here with the work done at Soho in connection with gas, but only to present our readers with



A Gasholder Constructed by Murdoch (in 1798) still in Use.

irrefragable evidence that it was done well. About fourteen years ago, the Soho works passed into the hands of Messrs. W. & T. Avery, Limited, the well-known makers of weighbridges and weighing-machines, whose business was established in 1730—two years after Boulton was born. Among the other plant which they then acquired was a gasholder which Murdoch constructed in 1798, and which is still in service. It is shown in the accompanying illustration, which we produce from a photograph supplied by Messrs. Avery.

The holder has a capacity of 20,000 cubic feet; and it will be noticed that there is very little difference between it and one of to-day, except in the centre leading guide, which consists of a rod passing through the centre of the holder. It appears that there were originally two gasholders made with the central rod; and it is not a little strange that one of them should still be in daily use on the very site where it was erected. Reference in the "Birmingham Daily Post" to the existence of this holder brought a letter from Messrs. Avery bearing out the statement; and they added: "Workmanship which thus stands the test of well over one hundred years must, at the outset, have been characteristic of the thoroughness of the old Soho Foundry, where the famous partners laboured."

Before closing this article, it should be mentioned that complete illustrations and a detailed description of the Soho Works, just before they passed into the hands of Messrs. Avery were given in the "Engineer;" and that to an article in the current number of that publication we are indebted for some of the historical particulars here given.

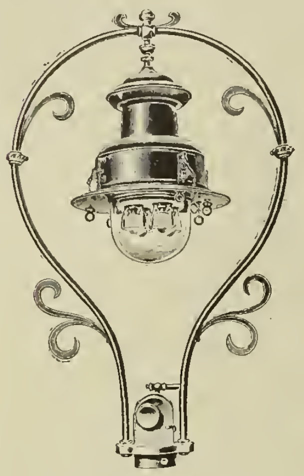
NEW DESIGNS IN INVERTED LAMPS.

The demands of customers, and the pressure of competition with lamps of varied quality in constitution, necessitate that makers shall be ever enlarging their ability to comply with desire, and thus to resist the inroads from other quarters upon the patronage they have cultivated. That is an indispensable condition in the commercial struggle of the times. For excellent lamp work, Messrs. Podmore and Co. have an established reputation; their productions incorporating strength and scientific and practical attributes. But they have found that high-power lamps are in request which are lighter in build, and somewhat less expensive than their standard types, and yet lamps in which the efficiency shall not be a whit inferior, or the facilities afforded for maintenance not in any way impaired. A range of such lamps for street, shop, or factory lighting, have therefore now been developed—from one to four inverted burners, and more if desired; and it may be taken that each burner in these lamps, consuming $3\frac{3}{4}$ cubic feet per hour at about 2 inches pressure, will give an efficiency of 40 candles per cubic feet. In all of the firm's lamps, the regenerative principle is applied as far as possible; and to this is attributed success.

It is unnecessary to describe in detail each one of this new series of intensive inverted lamps, as, excepting the variation of outside dimensions and the number of burners, in principle they are all constructed, from the one burner size to the four (or other number), on practically the same lines. Take, then, the three-light lamp as an example. Each burner is of cast metal, with air and gas regulator, by which the finest adjustment can be secured. The case is of copper, and it has a dome reflector. Just above the reflector a portion of the cylindrical top of the casing is formed so that it can be raised and held suspended, and all the upper parts of the vertical burners, with the adjusters, are exposed to view; or the same movable part can be had with a doorway so that it can be revolved instead of lifted, and attention be given to each burner separately by means of the door. An enamelled steel frame, held by a catch, supports the globe, which can be had plain, or for shop lighting with opal on the side facing the road, and plain on the shop window side. A reflector divides the upper from the lower part of the lamp; and as the products of combustion are all collected in a chamber and conveyed away by a central chimney, the primary air supply to the burners cannot be vitiated. The primary air being taken into the large annular chamber formed by the outer casing with the central chimney (containing the hot products of combustion) running through, nothing is supplied to the bunsens that has not been preheated. Round the inverted mantles protective glasses are suspended; but the use of these glasses is largely a matter of choice. It is not found that they enhance the illuminating power; but in street lighting they do serve as a protection to the other mantles when one is being changed.

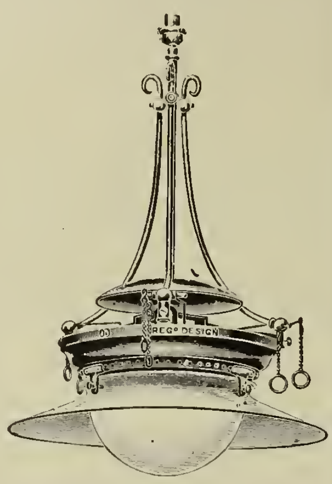
It has been remarked that each burner consumes $3\frac{3}{4}$ cubic feet per hour; if fitted with a flashing pilot light, a liberal total consumption will be 4 cubic feet. The pilot light, under normal conditions, is but a small blue flame; on the gas being turned on, the jet elongates, ignites the gas at the burner, and then gradually subsides again to the small blue flame. This is shielded from all draught by being fitted just above the reflector. It is altogether a good looking lamp, and well finished. Though lighter than the

firm's preceding standard patterns (to which they still accord premicr position), the lamps give an excellent account of themselves; and the readiness with which renewals of any part can be effected will cause maintenance to be comparatively low. It may be taken that, consuming 3¾ cubic feet of gas per hour, each burner gives an illuminating power of 150 candles; and three 450 candles. This illuminating power is not attained immediately on lighting up; but it proves the effect of the preheating of gas and air, that it is not until the lamp is well heated that the maximum illuminating power is obtained, and then the light is brilliant. The four-burner lamp is built rather stronger than the three-



New Four-Burner Inverted Lamp for Street Column.

(The Controller is on Top of Standard.)



No. 2003 "M. G." Lamp, with Reflector.

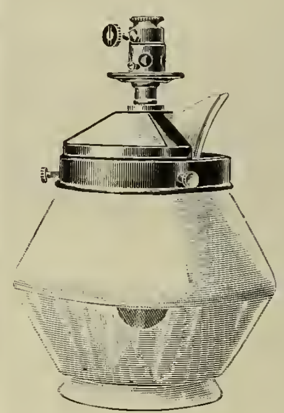
burner one; and this has been designed to compete with the Graetzin form of lamp. The two and one burner lamps will have their particular spheres of application. Though rather more expensive, the predecessors of this new series of lamps still retain favour for strength and durability. In them, regeneration is likewise provided for; they have strong angle burners; and the means of gas and air adjustment are all outside the lamp, and so kept cool, allowing regulation to be made at any time. The burners, too, are all separately controlled, so that one or any number of the burners with which the lamps are fitted can be used as required.

A simple high-power shadowless lamp, with a cluster of three inverted burners, is another new pattern; and it is particularly suitable for restaurants and dining-rooms. Between the pendant and the burners there is a simple dome-shape protector; and below this is suspended a well-expanding ornamental shade of graceful outline, and tinted towards the edges. The mantles can be enclosed in a glass bowl or left exposed just as desired. The effect either way is good. The burners are of the angle type, with gas and air adjustments outside the path of the rising heat from the mantles. Preheating is secured by the construction of the burner. The inlet for the gas and air is small; and the bunsen tube gradually expands in internal diameter to a mixing chamber before passing to the nozzle of the burner; so that throughout the travel room is given for the expansion of the combustible mixture. Each burner consumes 3 cubic feet of gas per hour, and the efficiency is from 40 to 45 candles per cubic foot, according to pressure and quality; so that, taking the lower duty, the total illuminating power is 360 candles.

The 2003 "M. G." lamp is another new type. It is a lamp with a comparatively shallow head, and can be had fitted with one, two, or three burners. As required, it is furnished with a large reflector, or without. Enamelled in a cream colour, and outlined with gold, it is a handsome lamp.

But there are so many new desigus to be seen in the showrooms of the firm that description would necessitate much more space. We must content ourselves therefore by saying that the "Ivex" lamp, one of the inverted regenerative lamps, with perpendicular burner, arrests attention both for neatness and efficiency. The firm have also made a speciality of lamps fitted with angled reversible globes, with opal one side and plain glass the other; so that if the opal part is being used at the bottom the light is reflected upwards to the ceiling, and a soft, well-diffused illumination is the result. If a strong light is wanted immediately under the lamp, by reversing the globe with the opal part at the top, the light is directed downwards. Several new designs of lamps for use in tropical climates, where dust and insects demand special consideration in the construction, are to be seen. The square type of street lamp with inverted burners continues in good demand—in fact, in these days, almost all new lamps are fitted with the inverted burner; the upright form being now much neglected by customers. It is not surprising.

Before concluding this notice, a new and special burner for domestic use may be referred to. It is a burner in which certain new features have been introduced all combining to give efficiency, and to preserve a cleanly and cool appearance. The burner is an inverted one, with all parts china-cased in the path of travel of the heated products. The burner is fitted with a globe, angled top and bottom, and reversible; so that, as explained previously, the opal part may be at the bottom for upward reflection of the light to the ceiling, or with the opal part at the top a good downward light is afforded. It is a very neat burner, is fitted with gas and air adjustment, and has a special outlet for the lateral escape of the products of combustion, so preventing discoloration of the fittings. The standard size consumes from 2¼ to 2¾ cubic feet; and the light is soft and attractive. This lamp should meet with a good demand.



The "Domestic" Burner.

HIGH-PRESSURE GAS IN THE CITY OF LONDON.

Further Extensions.

Since we chronicled the early continuation of the Fleet Street high-pressure gas-main to the offices of "Punch" and the "News of the World," in Bouverie Street, further large extensions are taking place and are contemplated. The main has been carried through Crane Court to serve Messrs. Shaw and Sons, printers, in Fetter Lane. Last week a further extension was made, whereby the main was taken down Whitefriars Street and Hanging Sword Alley to the large building of Messrs. E. Lloyd and Co., which extends from Salisbury Square to Whitefriars Street; and now it is being continued farther east, across Ludgate Circus to the foot of Ludgate Hill, then going northwards up Farringdon Street as far as Seacoal Lane towards the Old Bailey, where it will be tapped to supply the large printing establishment of Messrs. Cassell and Co., Limited, running into Fleet Lane and Belle Sauvage Yard. This is one of the first of the great publishing houses to recognize the importance of high-pressure gas in connection with their large printing plant.

A more important extension that is about to be carried out is in a southerly direction—viz., the New Bridge Street approach to the newly-widened Blackfriars Bridge. The bridge is at present lighted in a very efficient manner by forty of Sugg's high-pressure upright burners at 10 inches pressure, giving a duty of 30 candles per cubic foot, or 300 candles per burner; the burners being supplied direct from the Beckton high-pressure main in the immediate vicinity. Owing, however, to the discovery of a high-pressure inverted burner, capable of using the gas at 54 to 70 inches pressure, it has been decided to relight the bridge in this manner. The services have already been tested for the new pressure; and though they have been in use for nearly nine years with high-pressure gas, they have stood the test. Advantage has been taken, during the construction of the bridge works, to extend the main round the new widened portion of the Embankment to light the staircase approach to the public passenger subway, and bring the main across the Embankment by the London County Council boundary to link up with the New Bridge Street main, so as to get a return flow over the bridge from the Southwark end back to the City, where formerly there was a dead-end. The temporary wooden rests that are about to be erected on the new roadway of the northern approach will also for awhile be lighted with high-pressure inverted burners; one of the flame arc lamps on the approach having been already removed. The public passenger subways crossing from the Embankment to the Hand-in-Hand Fire Insurance Office, and from the District Railway Station to the Royal Hotel, will be lighted by gas; inverted mantles being used, and low-pressure gas being supplied.

Anticipating that high-pressure gas will be required at some future time to light New Bridge Street, the Gaslight and Coke Company intend to take the opportunity, while laying their new high-pressure main, to drill, tap, and "tee" it for the necessary lamp services.

Automatic Ignition of Gas.—A French patent has been taken out by MM. Lubeck and Payet for a process and apparatus for the preparation of a compound for the automatic ignition of illuminating gas. According to an abstract of the specification in the "Journal of the Society of Chemical Industry," native hydrated cobalt oxide is mixed with cuprous chloride and heated *in vacuo* to 450° C., and a current of hydrogen or of lighting gas, previously heated to 120° C., is then passed over the mixture. The mixture is treated with hydrochloric acid so as to dissolve the cuprous chloride and precipitate a double chloride of cobalt and copper, or a mixture of hydrated cobalt chloride and copper chlorides, according to the conditions of the heating in hydrogen. The precipitate is allowed to settle on pieces of pumice stone which are afterwards dried. The solution is used for coating a part of the incandescent mantle, and the prepared pumice stone is made into pellets which are fixed near the burner.

THE INVERTED INCANDESCENT GAS-BURNER.

By Henry O'Connor, F.R.S.Edin., Assoc.M.Inst.C.E.

[**A Lecture delivered before the Irish Association of Gas Managers, Aug. 10.**]

That this type of burner is the reverse of scientific will be gainsaid by no one. Gas, being lighter than air, tends to rise; heat also rises, for the same reason. Flames burn upwards; and yet in this burner we try to reverse all the laws of Nature. But (and this is an important part of the matter) we get the result required by this means—namely, the maximum of the light in a downward direction. With the ordinary upright incandescent burner we get no direct light at all immediately underneath; and if we had not the light coloured ceilings and walls to reflect the light, we should find darkness below the burner. This brings us to consider the advantages of light walls and ceilings in making the average light in a room of an even and regular quantity, which cannot be done without these reflecting agencies.

Of recent years there has been a tendency to increase the amount of light considered necessary for all purposes; and this is no doubt owing to the cheapening of the lighting agent through the introduction of the Welsbach incandescent mantle. It has, however, been accompanied by a desire to clothe the ceilings with papers having more or less pronounced patterns upon them, in place of the older method of whitewashing. These papers will absorb in many cases as much as 40 or 50 per cent. of the light thrown upon them; and this quantity absorbed is a complete loss to the general illumination of the room, as, with the newly whitewashed ceiling, 80 or 90 per cent. of the light thrown upon it is reflected in various directions. The heavy shadows are thus removed, and a softer and more even lighting is secured. This is specially advantageous with the upright burner, which radiates as much as 50 per cent. of its light above the horizontal. Such burners, in fact, give their maximum effect in a horizontal direction; and therefore we shall require to reflect this if we wish the light for reading or working purposes, which is usually required below the level of the light. Hence the walls must also be of a light colour. Orange coloured paper only reflects 55 per cent., green 10 to 46 per cent., pale red 16 per cent., brown 15 per cent., deep chocolate will only give out 4 per cent. of the light thrown upon it. Æsthetics may demand "dirty greens" and dull colours; but if we want "light, more light," we must keep to pale and light colours.

The next matter of reflection to be considered is the globe. One of the best for transferring the horizontal rays to the vertical was the "Holophane" globe, manufactured on the prismatic principle, after the type of the lighthouse lenses. These globes effectively spread the light in the downward direction. They were, however, necessarily rather expensive to manufacture, and have gradually fallen somewhat out of favour. The advent of the inverted burner also rendered them less advantageous; but there are many opal globes now in use which do not reflect the light in the best direction. The ordinary opal globe with the clear glass at the lower part has its sides too steep. They should be at 45° with the horizon, and not 60° or 70° as is usual. The light would then be directed downwards, through the clear glass portion instead of outwards, where the opal portion of the globe obstructs their direct radiation.

The inverted burner, in contradistinction to the upright, gives 76 per cent. of its light below the horizontal—its maximum being at about 30° below it; while directly underneath there is some 80 per cent. of the maximum light radiated in any one direction. This is, of course, rendered possible by the mantle being fully exposed in this direction without the interposition of any part of the burner. This leads to the placing of all or most of the burner over the flame, and in many cases results in the obtaining of a less quantity of light than might be possible from the gas consumed. To get the best effect from the burning of a gas of any composition, a definite quantity of oxygen is required to combine with the carbon and hydrogen contained in the gas; and this is necessarily accompanied by the proportion of nitrogen (say, 79 per cent.) contained in ordinary air.

To find out the quantity of air required to ensure complete combustion, we must know the percentage of H, CH_4, and CO. We can ignore the CO_2 and N, as these do not require oxygen and are not combustible. It is interesting to see what the quantity required will be with (say) a coal gas and a water gas, as these will illustrate the considerable differences between gases of different compositions. First, with a coal gas having a composition of (say) 53 per cent. of H, 37 per cent. of CH_4, and 5 per cent. of CO, and taking 100 feet as the quantity of gas to be used, we shall require for the H one-half the volume of O to form H_2O, as there are two volumes of H to one volume of O in the mixture; so that 53 cubic feet of H require 26·5 cubic feet of O. For the CH_4, we shall want twice the volume of O, or 37 cubic feet; CH_4 requires 74 cubic feet, because the C requires twice the quantity of O; and the H_4 requires 2 O. Thus the combination requires 2 O. For the CO, half the volume of O is required to form CO_2, or 5 cubic feet of CO require 2·5 cubic feet of O. Thus 100 cubic feet of a gas of this composition require 103 cubic feet of O. Now when air is used as the source of this O, the percentage of O contained in it is only 21 by volume; so that we shall need to make a rule-of-three sum to find the air required. Thus,

$\frac{103 \times 100}{21} = 490$ cubic feet of air necessary for 100 cubic feet of the gas, or 4·9 cubic feet of air for each cubic foot.

Taking a carburetted water gas as containing 35·6 per cent. of H, 17 per cent. of CH_4, and 28 per cent. of CO, we shall find that this requires: For the H, 17·8 cubic feet; for the CH_4, 34 cubic feet; and for the CO, 14 cubic feet (65·8 cubic feet in all), or 100 cubic feet of gas require 65·8 cubic feet of O. $\frac{65 \cdot 8 \times 100}{21} = 313$ cubic feet, or 1 cubic foot of carburetted water gas requires 3·13 cubic feet of air for complete combustion.

The 4·9 cubic feet of air will thus consist of 1·03 cubic feet of O and 3·87 cubic feet of N, and the 3·13 cubic feet of air of 0·66 cubic feet of O and 2·47 cubic feet of N; and this N has a cooling effect upon the flame, as it has to be heated and passes away carrying this heat, which might otherwise be used to give heat to the mantles. If the air is still further weakened by the addition to it of carbon dioxide (the result of all combustion of carbon) and water vapour (from the combination of the H of the gas with the O of the air), the proportion of oxygen is still further reduced, and the flame is cooled to a greater extent. This happens with many of the inverted burners now on the market, as the products of combustion—which are principally nitrogen, carbon dioxide, and water vapour—pass up round the air-holes of the bunsen burner, where some 3½ times of air is required to mix with the gas to get the best effect. This air is only drawn into the burner by the issuing gas, and, consequently, if the air is contaminated, a less quantity of oxygen is mixed with the gas in the primary combustion, and the green inner cone (which is to be seen when the proper proportion is obtained, and which gives a maximum heat of some 3220° Fahr.) is absent, and a lilac inner cone only is found, when the maximum temperature is probably only some 3080° Fahr. The light given by a mantle is greatly increased by a rise in the temperature of the flame to a much greater extent than is represented by the increase of heat; only a small percentage increased heat giving a large percentage of increased light. This is obtained by making the flame smaller for a given consumption of gas; and despite this reduction of size, the intense flame, when fitted with the proper size of mantle, gives out a greater amount of light.

It cannot be too often repeated that when complete combustion occurs only a given quantity of heat can be evolved from a given quantity of gas—say, on an average, 600 B.Th.U. per cubic foot, whether a bunsen, flat-flame, high-pressure, or blow-pipe flame is used; and the size of the flame varies inversely as the intensity. So that the greater the intensity of the flame, the smaller it is. We can calculate the number of B.Th.U. obtainable if we know the composition of our gas; and taking again the coal gas as containing 53 per cent. of H, 37 per cent. of CH_4, 5 per cent. of CO, 4 per cent. of C_nH_{2n}, we have:

For the H,	53 × 326·2	=	17,288·6
,, ,, CH_4,	37 × 1024	=	37,888
,, ,, CO,	5 × 323·5	=	1,617·5
,, ,, C_nH_{2n},	4 × 2377·0	=	9,508
			66,302·1

or (say) 663 B.Th.U. per cubic foot.

If we have the carburetted water gas as before, we have:

For the H,	35·6 × 326·2	=	11,612·72
,, ,, CH_4,	17·0 × 1024	=	17,408·00
,, ,, CO,	28·0 × 323·5	=	9,058·00
,, ,, C_nH_{2n},	14·6 × 2377	=	34,704·20
			72,782·92

or (say) 728 B.Th.U. per cubic foot.

For the C_nH_{2n}, 2377 B.Th.U. per cubic foot has been taken, as if the whole were propylene (C_3H_6).

With increases of pressure of air and gas, there is practically no limit to the heat obtainable by a gas-flame; hence the very high duty of 60 candles per cubic foot which is obtained by the Keith high-pressure burners, where the gas is compressed to about 54 inches of water, or nearly 2 lbs. per square inch.

No inverted incandescent gas-burner is complete without regulators for both air and gas; so that the flame can be adjusted to exactly fit the mantle and keep the filaments in the hottest part of it, which is the outer envelope where the carbon monoxide is combining with the oxygen of the air and forming CO_2. Otherwise the mantle must be the exact size of the flame, which latter will vary with the pressure and quality of the gas, and is, consequently, difficult to fit. The regulator of the gas requires to be as near as possible to the outlet of the gas in the bunsen burner; so that the full pressure of the gas is available to cause the inrush of air—the ordinary tap only serving to reduce the quantity of pressure, and thus reduce the injecting effect. The regulation should be capable of delicate adjustment, and the air-passages be designed to allow easy travel for the air; so that there is no stoppage at all of flow. As before mentioned, the intake should be below the outlet for the products of combustion. With such precautions it should not be difficult—and, in fact, has been proved to be possible—to obtain as high a duty as 39 to 41 candles per cubic foot of gas consumed. The greatest fault with most of the regulators on the market is that the cone does not occupy the exact centre of the hole through which the gas issues; so that the air induced with the gas is not evenly mixed with it, and the heat of the mantle is not even throughout. The difficulty which the maker of the regulator experiences is that the heat is playing on

it while in use, and, consequently, when the regulation has to be changed, if it be delicately fashioned, it is fixed, and cannot be moved.

As regards heat evolved by burning gas, we may take it that, with an average gas, each cubic foot will give us some 600 B.Th.U., representing 600 lbs. of water raised 1° Fahr. As air has a specific heat of 238, the 600 B.Th.U. would raise (say) 2521 lbs. of air the same extent. One pound of air equals 13·1 cubic feet; so that the 2521 lbs. equal 33,025 cubic feet. If, then, we divide this figure by the cubic contents of the room, we get the rise in degrees. Taking the room as containing 1000 cubic feet, we should get a rise equal to 33° Fahr. But as we should change the air at the rate of 1200 cubic feet per hour for each person (and ventilation has to be allowed for at least two or three persons), the quantity of air to be heated is much more than the contents of the room, and the rise in temperature should not exceed 5° Fahr.

Many people think that the larger the mantle the greater the light. This is not necessarily the case, and with many burners the larger mantle reduces the candle power. I have had burners submitted to me to test with extra-large mantles, and have only obtained about 15 candles per cubic foot with them; whereas with the same burner and a smaller mantle, I have obtained as much as 39 candles per cubic foot of gas consumed. There is no doubt that the exposure of the mantle to the oxygen of the air deteriorates it, as does also dampness; so that it is important to know when purchasing mantles that they have been recently made, and that old stock has not been palmed off upon one. The coating of collodion also tends to reduce the incandescence at the time of first burning off. It would be better if we could do without this coating; but then the mantle would not stand the shocks and jars of travelling.

The principal argument in favour of the lower candle power gases is that a rich gas requires more air, drawn in for primary combustion, than a poor one; and as (as has been already remarked) this air is only drawn into the burner by the ingoing gas, it is clear that a smaller quantity of the richer gas has to draw in a larger quantity of air. This can only be possible with higher pressures, which are not always available. The best light is obtained when the air and gas are regulated to give a violent ebullition or popping when starting; this will become silent in about 5 minutes, when the burner is heated up and the slight excess of air (which caused the noise) has been reduced, owing to the heating of all the parts of the burner.

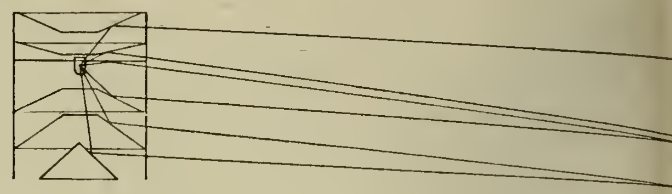
In view of the frequent employment of inverted incandescent burners for street lighting, some remarks regarding their use in this connection may not be out of place. We must first consider what is required for the best lighting; and there is no doubt that an even illumination over the whole surface of the road is what is most desirable. We want this light, not to read a newspaper laid flat on the road surface, but to enable us to see any obstructions which may appear. Hence the fact that light varies as the cosine to the normal of the ray of light, does not, in my opinion, enter into the question.

If, now, we consider that our lamps are fixed 60 yards apart and are 10 feet high, we shall find that the angle at which the greatest light is required is 6·36° below the horizontal, so that the most light may be shed in the direction of the road, midway between two lamps. Dealing, then, with the direct light only from the burner, which would be shed on a surface normal to the ray, and neglecting, for the reason above stated, the light on the surface of the road, we have a comparative distance of 90 ft. 6 in. to the point midway between the lamps, as against 10 feet from the lamp to the ground immediately under the light, or a difference of illumination of 82 to 1. If we desire a direct light from each lamp of 1-40th candle foot, making in all 1-20th candle foot as the light from both sources, we shall require each of the burners to give 205-candle power at 6·36° below the horizontal, and in a vertical direction only 5-candle power.

Now it is quite evident that our burners cannot give this light without some alteration of the light at present sent from an inverted incandescent burner, which is, roughly, equal at all degrees below the horizontal, but which is slightly greater at about 30° below. A concave reflector, which would serve to direct all the light radiated from a burner above 5° below the horizontal, would have to be of such a shape that, if we try to use this light, we shall have a number of reflected reflections, each with its loss of power (because no reflecting surface will give out all the light shed upon it), as the edge of the domed surface, on the opposite side, will obstruct the direct reflection in the required direction. Consequently, we must forego some of the more horizontal rays to utilize a greater number of those at higher angles; but even then we cannot get much benefit from these rays.

Then, again, for the light in a direct downward direction we may use some of this to reflect outwards, to come somewhat nearer the required light at the point midway between the lamps. At first sight, it would appear that a reflector of a curved cone pattern would best serve the purpose, placed on the bottom of the lamp; but further examination will show us that the point of the cone will come too near the mantle and be affected by its heat, so that some other form will have to be adopted.

I have shown in the diagram a suggestion for reflectors to utilize the rays, in both the upward and downward directions, which are not needed, if we desire an even illumination of the area. The light rays for the portions directly under the lamp, and up to 55° below the horizontal, are made to pass through the opal reflectors, and are consequently reduced; while the proportion



which is reflected is used to increase the light projected about the angle 6·36° below the horizontal, where the most light is required. These reflectors have been designed of a true conical form, so as to spread the light somewhat about the spot referred to; but the central rays are in the required direction. The cost of such reflectors is not great, and would tend to a more equal illumination of the area between the lamps than is possible without such aids.

The blackening of ceilings still continues, even with the inverted incandescent burner; and perhaps the remark made to me by an ex-gas manager may illustrate the cause of it, and enable you to convey the cause to your customers. He entered the hall of the offices which I then occupied, and, seeing the wall was very dirty above a steam-heated radiator, remarked "What dirty gas you have here." There was no gas within 20 feet. The dirt had been deposited on the condensed moisture, due to the cooling by the wall of the rising current of heated air, which, when so cooled, could not carry the same amount of aqueous vapour which it could when hot. He was, however, quick to recognize that the cause of this was exactly the same as the blackened ceilings over gas-lights, which the general public believe is due to dirty gas. His remark illustrates very clearly that these dirty ceilings are due to the cooling effect of the ceiling depositing the moisture which the hot air carries, and this moisture collects all the dust particles which are supported by the air. Thus the ceiling gets brown, and finally black if not attended to.

The President moved a vote of thanks to Mr. O'Connor. The lecture had been a very instructive one, and one which would be beneficial to all of them.

Mr. R. G. Shadbolt (Grantham) asked to be allowed to second the vote. There was more in the lecture than they could appreciate at the moment. It was one which appealed to him, and which represented, to his mind, an immense amount of very useful work. In regard to street lighting—which, in itself, was a subject well worthy of the attention of the Association—the question of refracting the lights of the street-lamps was one which, he must confess, was very little understood. They often talked about illuminating power and illuminating effect; but he was afraid there was very little interest taken in lighting effect as Mr. O'Connor had put it before them. The predominating thought in his mind was, how was it—why was it—that they always dealt in regard to these matters with the effect which they obtained from the gas, whereas the gas was, to some extent, a foreign element? Why was it they never dealt, or attempted to deal, with the result they got from the air that they used? He thought Mr. O'Connor would agree with him that if they approached the subject from this point, they were driven very rapidly to a certain conclusion. He once heard it said in a discussion on the subject by a gentleman who objected to what he termed low-grade gas, that if the arguments adduced in favour of low-grade gas were logical, they ought to go on to a non-illuminating gas, and obtain from it the best lighting. This gentleman's remark, taken logically, was very near the mark, because it was an undoubted fact that the easiest method to obtain the best result from an incandescent mantle was by means of the non-illuminant constituents of the gas; and when they went into the question of what air was required to consume a heavy or a light gas, they came to this question—what was the best duty they could obtain from a cubic foot, or 100 cubic feet, of gas? If they approached the subject from the point of view of the non-illuminant constituents of the gas, they would find that, with the non-illuminant gases, they would obtain, per cubic foot of air consumed in their combustion, a duty of from 25 to 26 per cent. higher illuminating power for every cubic foot of air consumed than they would with a heavy hydrocarbon. This suggestion from the lecture they had just listened to had gradually obtained possession of his mind during the lecture. Taking the records from the beginning to the present time, they would find that they did not contain a more useful lecture than that which had just been delivered.

Mr. O'Connor thanked the meeting for the attention which they had given to his lecture, and also for the kind remarks that had been made regarding it. Mr. Shadbolt referred to the question of the quantity of air, or, if he understood him rightly, the amount of light to be got from a certain quantity of air, rather than the amount of light from a certain quantity of gas. The difficulty they had in this was that air was practically always the same; but, unfortunately, gas was not always the same. He did not say it varied from day to day, because gas managers were constantly watching the gas to see that it was of the same quality; but it varied in different towns. In this particular connection, he would like to call Mr. Shadbolt's attention to a very curious point. Taking carburetted water gas, which was about 30-candle power, so far as he could remember, and giving 728 B.Th.U. per cubic foot, and coal gas, which was about 16-candle power,

and giving only 663 B.Th.U., the gas with the higher heating power required a less quantity of air, and the gas of the lower quality, and lower heating power, required a greater quantity of air. It was not a question of high-grade or low-grade gas, it was a question of the constituents of either, or both, of these gases. This was what they had to look at; and it was a matter which a great many people lost sight of. He thought that the commonly expressed opinion in the South was that it was between three and four candles difference. He had tested Scotch gas (a gas made from a common kind of coal); and he found that the difference was only two candles. His point was this, that it was not the difference between the high-grade gas and the low-grade gas which caused the difference, but that it was the ingredients of the gas made in Scotland, and the ingredients of the gas made in London, because most of the Scotch coals, gas coals especially, were on the borders of the cannel coalfields, and therefore they partook much more nearly of the quality of cannel; and the gas made from them had a number of hydrocarbons of an entirely different nature to those which were found in the 15-candle gas which was made in England, from coals from the Newcastle and Durham districts. This was the reason for the difference; and he thought the figures he had given would illustrate it.

Mr. Shadbolt asked leave to explain that Mr. O'Connor did not seem to see the matter from the point of view which he did. He simply raised a question as to the duty to be obtained from a given quantity of air in the case of non-illuminant gases. Mr. O'Connor referred him to his tables, and said how the results obtained from carburetted water gas, which was of higher illuminating power, and required less air than ordinary coal gas, differed from those obtained from coal gas which contained a larger proportion of the heavy hydrocarbons, and which, in combustion, gave a lower duty than they obtained from a non-illuminant gas. What he wished was to get the difference in the duty obtained from the air consumed with luminous and with non-luminous gases.

CREOSOTE FOR WOOD PRESERVATION.

In the portion of the speech of the Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter), at the recent half-yearly meeting, in which he dealt with the subject of residual products, he remarked that, owing to timber becoming scarcer, it was found necessary and economical to creosote railway sleepers, &c., and thus prolong their life. This statement is verified by an article in the current number of the "Journal of the Franklin Institute," in which it is stated that more than 56 million gallons of creosote were used in preserving timber in the United States last year. These figures are based upon reports made to the Forest Service by 44 firms operating 64 timber-treating plants. Assuming that, on an average, one gallon of creosote will protect a cubic foot of timber from decay, more than 100 million cubic feet of cross-ties, piling, poles, mine, and other timbers were given a treatment that will greatly increase their life and usefulness. Never since timber treating began on a commercial scale in the United States has the domestic supply of creosote been equal to the needs of the industry. With the rapid development of wood preservation in recent years, the insufficiency of the home production of creosote has become more marked. In 1908, 69 per cent. of the creosote used by the treating plants was imported, and only 31 per cent. obtained from domestic sources. Nearly three-fourths of the imported creosote comes from England and Germany, some is obtained in Nova Scotia, and some in Scotland and Holland. The domestic creosote used by the treating plants was obtained chiefly in New York, Philadelphia, and other large cities.

Were all the tar produced which the coal annually coked in the United States is capable of yielding, it would distil as much creosote as is now used by the wood preservers. Unfortunately, American operators do not even get the fullest use of the limited quantity of coal tar made; for it does not pay the operators to distil it for creosote alone. Consequently, unless they can find a market for the associated products, it is not separated. Germany has gone far ahead of the United States in the development of coal-tar products, and her exports of them to America are steadily increasing. Ten years ago, the strongest advocates of the creosoting method of preserving wood could scarcely have hoped for the present advanced state of this industry. Formerly the production of creosote, from both coal tar and wood tar, far exceeded any demand for wood-treating purposes. The number of wood-preserving plants has, however, grown so rapidly within the last four years that America is not able to supply its own demand for creosote.

We regret to record the death on the 17th inst., at Purley Bury, Sanderstead, of Augustine Aglis, third son of Mr. W. J. Dibdin, F.I.C., F.C.S., in his 25th year.

According to one of the appendices to the report of the Principal Chemist of the Government Laboratory (Dr. T. E. Thorpe) on the work carried on there in the year ended the 31st of March last, 18,060 gallons of industrial methylated spirit were used in the manufacture of mantles for incandescent gas lighting, compared with 16,888 gallons in the preceding twelve months.

PRODUCER GAS FOR PUMPING-ENGINES.

In the "Journal" for the 15th of June (p. 727), we gave a paper, on "Working Results of Pumping-Engines Operated by Producer Gas," read by Mr. D. Hastings Irwin at the annual meeting of the Association of Water Engineers. The following are some of the observations to which the paper gave rise.

Mr. Alfred Towler (Leeds) said he should like to know whether the 300 H.P. named early in the paper was brake or indicated or the nominal horse power, and, whatever it was, how it was ascertained. It would also, perhaps, be simpler if the costs were reduced to per 1000 gallons of water raised 100 feet high. He made out that this would appear as 1·62d. and 0·228d. He should like to know if the brake horse power given was actually determined on the site, because, of course, if it was determined in the works it did not necessarily mean that when they were working with their producer on the site their conditions would be precisely the same. With reference to the comparative results given as between steam-engines and gas-engines, he took it that the two were doing the same work. He should like to know the age and condition of the steam-engines. If they were performing the same work, the steam-engines were doing about 31 million duty—an exceedingly poor result. If this were so, was it fair to compare a new gas plant with an old steam-engine plant about to be abandoned? He felt he must take exception to the statement "that the working costs of gas power are considerably less than those of steam power, per brake horse power." With regard to the last example given of a gas-engine direct-coupled to a centrifugal pump, he thought this was an exceedingly good one; and both the gas-engine makers and the pump makers should be very proud of the result. In the course of his paper, the author said that if a gas-engine were more heavily loaded it would give a better efficiency; but in his (Mr. Towler's) opinion, the makers were wise in not loading it more heavily. Had they done so, it might have stuck altogether. To his mind, the great trouble with suction-gas plants had been where they had been loaded too near to their maximum power. They all knew that a steam-engine might be very greatly overloaded, but that at present the overloading of a gas-engine—he meant the capacity for taking a material continuous overload—did not exist.

Mr. Easton Devonshire (London), speaking as a practical man interested in the subject, said he felt there was a certain amount of caution to be observed before coming to a decision as to whether suction-gas plant would, in the long run, turn out to be more economical, compared with the best and latest types of steam plants. Of course, one of the considerations would be the cost of fuel in the two cases, which would vary enormously in different localities. In the South of England they were paying for anthracite already nearly twice what they paid two years ago. He saw that at the Waskerley reservoir of the Weardale and Consett Water Company they were able to use three-fourths of coke to one of anthracite; and he hoped that something of the same kind might be done in the plant he was interested in. He gathered that the fuel to be used depended somewhat on the type of the producer. All these considerations were so important and so undetermined, that he thought they must wait for a few years before they could satisfy themselves as to what was to be the most economical means of pumping water under the conditions dealt with in the paper.

Mr. Percy Griffith (Westminster) said that as the author had referred to a test of which particulars were sent by him (Mr. Griffith), he should like to make a few remarks on the paper generally, as well as on this test in particular. He ought, perhaps, to have (editorially) corrected the author's reference to a "series of tests," as they had not had the opportunity of carrying out such elaborate tests as they would have liked. Those referred to in the paper were taken over a period of twelve hours, in the case of each of the two plants. The whole plant had been in use for twelve months before the trial was made, and the water had occasionally had a great deal of sand in it. The pumps had, therefore, been pumping sandy water off and on during a period of twelve months, and were not in a very efficient condition; so that under more favourable circumstances much better results would no doubt have been obtained. With regard to Mr. Graham's design of the plant in use at Woodmansterne, he was very interested in the worm-gearing. The question was the common difficulty associated with high-speed engines driving pumps; and it was interesting to see an example of the latest device for overcoming this difficulty. He believed the results were perfectly satisfactory; but he wanted to ask whether any trouble had been met with in connection with side-thrust. He should like to offer a few observations on the general question of the testing of pumping plants. The point had already been referred to, that tests were generally made under ideal conditions which were not met with in ordinary working. He quite admitted, as Mr. Towler had said, that a new plant was not in an ideal condition for giving the best of results. Everything was what was commonly called "green;" and there was a good deal more friction, both in pumps and engines, during the first few weeks of their being in regular work. Probably the most satisfactory period for a test to be taken would be at the close (say) of some three months' running. But, of course, after this the conditions of wear and tear must get more and more unsatisfactory as time went on. Still, it had been often urged that such special tests taken when the plant was in its most favourable

condition were far from showing the actual working results to be obtained over a period of years, which, after all, was what most of them were concerned about.

Mr. C. Liddell Simpson (London) said he had recently had some experience with gas-engines driving pumps through gear. In one case, a horizontal gas-engine was driving, through a large worm-gear, on to a shaft which drove a set of "concertina" pumps; the power transmitted through the gear being upwards of 100 pump horse power. His firm had made a very careful test, and as the brake horse power could not be measured on the site, it was necessary to get the exact indicated power from diagrams; and the greatest accuracy had to be maintained, so that the indicated horse power should tally with that which had been obtained in the makers' works, where the engine had been previously tested. They had not found any difficulty in checking independent sets of cards, working out the indicated power, and getting the results to agree very closely indeed with those which had been previously obtained on trial in the works. This pumping plant was interesting, because one of the largest examples of worm-gear for transmitting the power had been adopted. Of course, with everything new, there was a considerable amount of trouble in getting the running engineers, who looked after the plant, to give the special and close attention which was necessary; and, in the case of a gas-engine driven by suction-gas producers, unless the producers were thoroughly understood and looked after, and the superintendent kept a close eye on the men who were running the plant, there was bound to be trouble. With regard to the suction-gas pumping plant driving a high-lift pump at Woodmansterne which his firm had supplied, the high-lift pumps were driven direct through worm-gear; the shaft being direct-coupled to the gas-engine. His firm had considerable experience with these forms of gear for transmitting power, and there was no doubt they gave very good results in running, and were very efficient.

The President (Mr. R. Askwith) remarked that one or two points in connection with the gas-engine had struck him very much, and one was the similarity of the working costs they had had laid before them. The Waskerley engine had cost, in fuel alone, 0·11d. per 1000 gallons lifted 100 feet. Mr. Griffith gave 0·12d. It was very interesting, when they took into account the different costs of fuel in various places, that these figures should be almost dead-level. At Waskerley, they were using a mixture of three of coke to one of anthracite. The coke cost 10s. 6d. per ton, and the anthracite something like 42s. per ton delivered at the engine-house. The average price, therefore, came out at 18s. 4½d. per ton. They could run the engine for a considerable period upon coke alone, but for the fact that it fluxed, and the bars of the generator got choked. They found that, mixing in this proportion, the fluxing did not take place, and the generating plant was not injured. In giving the figure of 0·11d., he might say they simply took a year's running. He thought the amount debited against the engine for fuel during the year was affected by the fact that they closed the pumping, and shut-down rather suddenly, because heavy floods came, and partly filled the reservoir into which the water was being pumped, and made it no longer necessary to pump; and they had a good deal of fuel left on hand. He believed that if they had weighed the unused fuel, and credited it, the cost would probably have worked out at 0·10d., which was lower than any others quoted. This seemed to him to be entirely accounted for by the fact that they had a suitable coke manufactured in the locality. They obtained it from Messrs. Pease and Partners, Limited, who screened out a special size for them—walnut size—and it answered their purpose admirably.

Mr. Irwin, in reply, said he quite admitted that the main question with the producer plant was the first cost of the fuel. Anthracite had gone up considerably in price of late years, owing to increased demand due to extended use of producer plants. But any gas plant which was originally designed to work with anthracite could be used with gas coke. It was, however, necessary to see that there was sufficient margin of power in the engine, as the output of the engine was reduced by about 7 per cent. if gas coke was used instead of anthracite. The 300 H.P. engine which he had mentioned was originally worked with gas made from anthracite. When he visited the plant some months after it had been started, he suggested to the owners that they should use gas coke, as it was only about one-third the price they were paying for anthracite. There was a sufficient margin of power in the engine to allow of making the change, and therefore it was carried out, with very beneficial results so far as working expenses went. The gas plant itself required no alteration. He had listened with interest to the President's remarks, and thought if he was using gas coke free from tar there ought to be no difficulty with it.

The President: It was not the tar that was the trouble, but the iron contained in the coke.

Mr. Irwin went on to say that the quicker a gas-engine was run, the less would be its first cost in pounds sterling per horse power; but he quite agreed that it was advisable to keep the speed as low as possible. Mr. Towler had raised the question as to how the 300 H.P. was ascertained, and wanted to know whether the consumption of 1½ lbs. of gas coke was per indicated or per brake-horse-power. He had pleasure in informing him that the consumption was taken on the brake-horse-power; it was calculated on the average working expenses spread over a number of months. The question had been raised as to the class of fuel which could be used in producer plants. As a matter of fact, at the present time his firm had gas plants working on anthracite, bituminous slack, peat, cotton-seed refuse and cotton cake, and even on leather refuse from boot making; also on charcoal. There were plenty of producer plants working on this fuel in India, Burma, and China, as well as in Australia. In the last-named place, there were gas plants working with sheep's wool, and even with sheep's fat; so that the catalogue of fuels suitable for producer plants was a fairly comprehensive one. It was true in the past there had been difficulty in starting large gas-engines; but now that compressed air had been generally used, this drawback had disappeared, and they could be started quite as reliably as steam-engines. The question of overload could easily be arranged by putting in a sufficiently large engine in the first place, and by not regularly working it up to its maximum output. The workiug expenses at Woodmansterne could be reduced by using coke instead of anthracite, providing there was a sufficient margin of power in the engine to allow of them doing this. In reply to Mr. Griffith, on the subject of the best method of testing the gas consumption in an engine, he (Mr. Irwin) was of opinion that a counter fixed to the head of the engine gas-valve, in conjunction with the speed-counter recording the number of revolutions of the engine, was all that was required; and it gave very accurate results. If the engine was in anything like working order, there was little chance of a charge not being ignited on admission to the cylinder. His firm had recently installed a very large high-pressure fire-service pumping plant at Winnipeg, consisting of four 500 H.P. and two 250 H.P. gas-engines, each driving by gearing a set of three-throw vertical double-acting piston-type pumps. The larger sets were capable of delivering 18,000 gallons per minute against a pressure of 300 lbs. per square inch; and the two smaller sets 900 gallons per minute at the same pressure. This plant had been recently tested; and it was found that the duty in foot-pounds of work done per 1,000,000 B.Th.U. consumed was, in the 250 H.P. sets, 211,516,500, and in the 500 H.P. sets 177,246,250. The thermal efficiency ratio per indicated horse power in the smaller sets was 0·481, and in the larger sets 0·294; and the thermal efficiency per water horse power was 0·271 in the smaller sets and 0·277 in the larger. The mechanical efficiency of the pumping units was 83·1 and 77·5 per cent. respectively. Since the paper had been read, Mr. B. W. Bryan had pointed out that the figures given of the Tendring Hundred Water-Works test were not all quite correct. The tabular statement should be as follows:—

Water horse power	57·50
Total head	402·00 feet
Consumption of anthracite per water horse power. .	0·88 lb.
Cost per water horse power.	0·1460d.
Cost per 1000 gallons lifted 100 feet high.	0·0749d.

FIRE RISKS OF ELECTRIC LIGHTING.

The oft-asserted claims of safety of electric lighting in respect of causation of fire have been again refuted by statistics which are quoted in a recent number of the "Journal für Gasbeleuchtung" by Herr F. Schäfer, of the German Continental Gas Company of Dessau. The figures that he gives are from an official report of the Statistical Department of the Prussian Ministry of Agriculture relating to the fires which have occurred in Prussia in the years 1906 and 1907. The damage caused by fires proved to have arisen from different modes of lighting is shown in the appended statement for the two years, as well as the total amount of damage which, in addition to that of which the cause was proved, was in all probability due to the same agents.

Damage Resulting from Fires in Prussia.

Cause of Fire.	Cause Proved.		Cause Proved or Conjectured.	
	1906.	1907.	1906.	1907.
Electrical faults . .	£9553	£60,937	£77,012	£151,497
Gas for lighting, cooking, or heating .	9818	17,425	23,146	17,880
Petroleum	32,726	36,550	37,536	41,353

These figures are most instructive, as they show that in the year 1907 much more damage through fire was proved to have resulted through electricity than through gas and petroleum together; and this notwithstanding the far wider use of gas than of electricity. The figures also show that the rules for securing the safety of electric lighting promulgated by the Association of German Electricians, of which so much was expected in the way of diminution of damage by fire, have not been instrumental in arresting the continuous increase in the losses caused by fires arising from electrical faults.

Bonding new and old concrete can be accomplished in the following manner, according to a paragraph in "Engineering Record." Clean the surface of the old concrete with clear water and a stiff broom. Apply a mixture of one part of hydrochloric acid and three parts of water with a brush, making several applications one after the other. Then scrub the surface with clean water and a stiff brush until all the acid is washed away and the surface is perfectly clean and free from loose particles. While it is still wet, apply the fresh concrete, and keep the new concrete damp for at least a week; being careful not to allow it to become dry at any time.

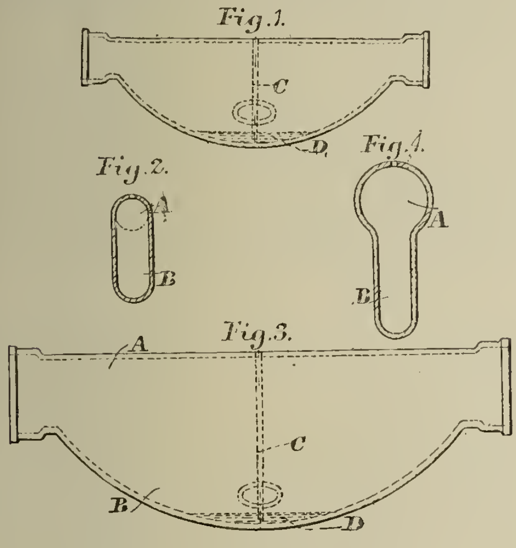
REGISTER OF PATENTS.

Syphons or Catch-Boxes for Gas-Mains or Pipes.

BELTON, J. C., of Chester.

No. 18,542; Sept. 4, 1908.

This syphon or catch-box is made in the form of a "fish-bellied" pipe of cast iron, having (say) a socket at each end. The body of the vessel is segmental in longitudinal vertical section and semi-oval in transverse section; its maximum depth being at the centre, and equal to about three diameters of the pipes to which it is connected. The width of the vessel is the same as the diameter of the pipes to which it is connected; and the sides between the semicircular top and bottom are parallel. Immediately in the centre of the top, a "dip-pipe" is fixed and reaches to within about ½-inch of the bottom of the vessel. Provision is made for securing this pipe in the usual manner, so that it may readily be removed for renewal, and that the syphon-pump or stand-pipe may be attached to it for emptying the vessel.



Belton's "Fish-Bellied" Syphon Pipe.

The arrangement was referred to in the "JOURNAL" for June 22, p. 890; so that a brief description of the accompanying illustration will suffice. It shows in figs. 1 and 2 a side elevation and section respectively of a form of the invention applicable to mains of small diameter; while figs. 3 and 4 are similar views of a form suitable for larger mains.

The "fish-bellied" receiver or sump B is formed as a downwardly extending continuation of the pipe A having in longitudinal section a rounded bottom made the same diameter as the pipes forming the main. The dip-pipe C comes to within a short distance of the bottom of the receiver B; so that when the receiver is cleared of liquid (shown at D) there can be very little left in it. In large pipes a heavy and cumbersome casting, with an unnecessarily large volume, would result if the above method were used; so the form shown in figs. 3 and 4 is used, in which the receiver B is of smaller width than the pipe portion A, but is in all other respects similar to the first-described form.

Gas-Engines.

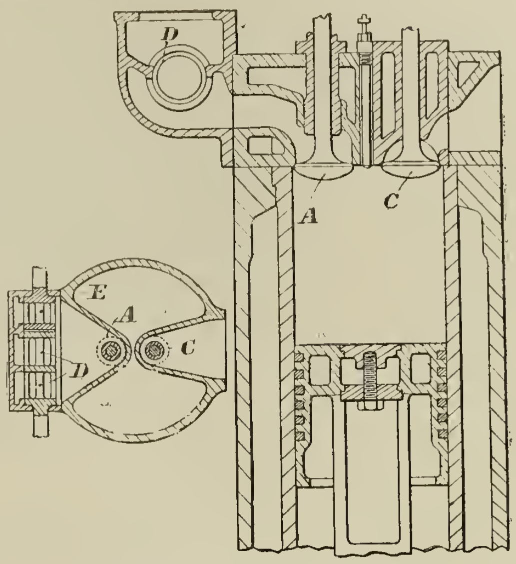
BURSTALL, F. W., of Edgbaston.

No. 21,782; Oct. 15, 1908.

This invention relates to a four-stroke cycle gas-engine of the scavenger kind, in which the inlet valve into the cylinder is also the inlet valve for the scavenger charge, and in which between the gas and air valves and the inlet valve there is a certain space into which the scavenging valve also opens—a type of engine well known. An improved cycle of operations is, however, provided. Arrangements are made for the usual proportional admission of air and gas during the suction stroke in such manner that the pressure into the cylinder is, as usual, below atmospheric—neither the air nor the gas being under pressure. A fraction of time before the end of the suction stroke, and while the inlet valve is still open to the cylinder, the admission of air and gas to the space and cylinder is cut off (which causes a drop in the pressure within the space and the cylinder), and a second air-valve is opened between the atmosphere and the cylinder and the space. Air thereupon rushes through the valve and the space and into the cylinder, carrying with it the contents of the space; so that they are washed or cleared out into the cylinder, to be used as part of the explosive charge. The air admitted through the second valve is not in any way under pressure; and the opening of the valve may be simultaneous with the closing of the ordinary air and gas valve, or a fraction of time afterwards.

The illustration shows how the arrangement of valves is made—a longitudinal section of the cylinder, and a transverse section to a reduced scale.

The inlet valve to the cylinder is at A; the exhaust valve at C; the combined rotary air and gas valve, to admit the proportionate charge, at D; and the second air-valve (which has two functions—the one to clear the space into the cylinder, and the other to admit the scavenging air) at E. The valve D, as usual in an engine of this type, is under the control of the governor; and the valve E is moved by a half-speed shaft. The valve E is closed while the valve D is open, and open while the valve D is closed. At one time (near, or at the finish of, the



Burstall's Four-Cycle Gas-Engine.

suction stroke), it opens to the atmosphere to admit air to sweep the contents of the space into the cylinder, to be used as part of the explosive charge, while it opens for scavenging, on the exhaust stroke, preferably from a space containing air under pressure—it being usual in an engine of this type to use the scavenging air under pressure.

The construction of the rotary valves forms no part of the present invention. They were described in a prior patent, No. 10,444 of 1908.

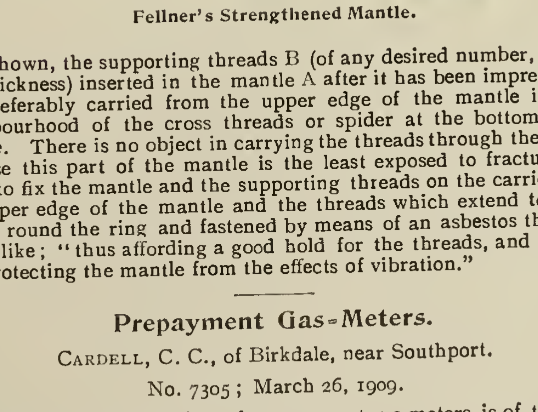
Incandescent Gas-Mantles.

FELLNER, J., of New London Street, E.C. (Partly communicated from OBERFELT AND CO., of Berlin).

No. 5260; March 4, 1909.

According to this invention, a durable mantle is said to be produced by threading through the fabric of the mantle, after it has been impregnated, reinforcing threads which have not only been rendered luminous by impregnation, but have also been hardened. As these supporting or reinforcing threads are produced independently of the fabric of the mantle, it is possible to impart to them any desired degree of hardness (according to the particular circumstances in which the mantle is to be used) by adding to the luminous solution with which the threads are impregnated a quantity of beryllium nitrate and a proportionately greater quantity of didymium nitrate—the exact amount depending upon the degree of hardness to be imparted to the reinforcing threads.

The supporting threads should preferably be attached to the supporting ring or the like carrying the mantle simultaneously with the fabric. In the case of inverted gas-mantles, the threads may be carried up to the upper edge of the fabric and then tied round the carrier ring by asbestos threads. In the case of mantles for upright burners, the supporting threads can be fixed to the upper ring to which the edge of the mantle is fastened.



Fellner's Strengthened Mantle.

As shown, the supporting threads B (of any desired number, length, and thickness) inserted in the mantle A after it has been impregnated, are preferably carried from the upper edge of the mantle into the neighbourhood of the cross threads or spider at the bottom of the mantle. There is no object in carrying the threads through the spider, because this part of the mantle is the least exposed to fracture. In order to fix the mantle and the supporting threads on the carrier ring, the upper edge of the mantle and the threads which extend to it are passed round the ring and fastened by means of an asbestos thread E or the like; "thus affording a good hold for the threads, and effectually protecting the mantle from the effects of vibration."

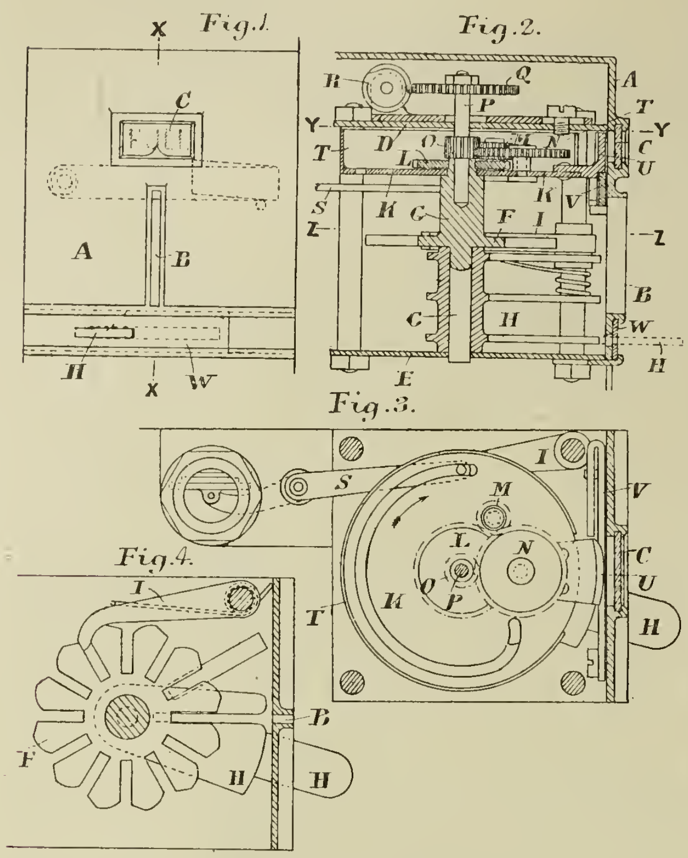
Prepayment Gas-Meters.

CARDELL, C. C., of Birkdale, near Southport.

No. 7305; March 26, 1909.

This coin-freed mechanism of prepayment gas-meters is of the type in which the coin is caused to connect an externally operated handle with the internal mechanism, so that the latter may be set to deliver a predetermined quantity of gas; means (such as interchangeable toothed wheels) being provided whereby the apparatus may be regulated to

deliver different quantities of gas per coin inserted according to the current price of gas.



Cardell's Prepayment Gas-Meter.

Fig. 1 is a front elevation; fig. 2, a vertical section on the line X; fig. 3, a horizontal section on the line Y; and fig. 4, a horizontal section on the line Z.

A is the front of the casing; B, the coin slot; and C, a glazed opening through which the indicator may be inspected. F is a star-wheel fixed to a spindle G, the lower part of which is of reduced diameter and passes through the boss of the coin-carrier H, and is supported in a bearing in the bottom plate. The star-wheel is fashioned with slots, and the carrier H is formed with a slot to receive the coin—the latter being supported upon the bottom plate, in which a discharge slot is formed. I is a spring-actuated pawl engaging with the slots of the star-wheel. The upper part of the spindle G carries a slotted disc K loosely mounted, so as to be capable of rotating thereon, and has fixed to it a toothed wheel L. The disc has mounted on it a pinion M, which meshes with the wheel L and with a toothed wheel N, which is also mounted on the disc. The wheel N meshes with a pinion O fixed to a spindle P, the lower end of which is free to rotate within the upper part of the spindle G, and is supported at its upper part by a bearing in the top plate. The spindle P carries at its upper end a toothed wheel Q, which is interchangeable with others of different diameter, for regulating the quantity of gas to be delivered per coin inserted.

The toothed wheel Q is rotated by a worm R fixed, or geared, to the usual spindle which projects from the meter, and which is rotated by the passing of gas through the meter. The worm is carried by a slidable bracket adjustable to and from the spindle P by means of slots and set-screw, in order to adapt the position of the worm to the different diameters of the interchangeable wheels Q.

The disc K is formed with a slot concentric with regard to the spindle G, except where it becomes eccentric to the spindle for the purpose of opening and closing the gas-valve. A lever or arm S is fixed to the spindle of a valve arranged within a valve-chamber, and carries at its end a pin which enters the slot of the disc K. When the pin is in the concentric portion of the slot (as fig. 3), the valve is held open; and when the disc K has rotated in the direction of the arrow, the pin is guided by the eccentric part of the slot until the valve is shut.

The apparatus works as follows: On a coin being inserted through the slot B, it falls into the slots of the coin-carrier H and the star-wheel F respectively, and thereby interlocks them. The external handle of the carrier H is then moved from left to right, thereby rotating the star-wheel to the extent of one tooth, in which position it is held by the pawl I, and the coin falls through the slot into the till beneath. The movement of the star-wheel is communicated by its spindle G to the toothed wheel L, and through the pinion M and toothed wheel N to the disc K, which is rotated a proportional amount—the pinion O being held by the meter mechanism. The movement of the disc causes the lever S to open the valve admitting gas to the meter, upon which the worm R begins to rotate and work the disc K back to its shut position through the toothed wheel Q, pinion O, wheel N, and pinion M.

Any number of prepayments (up to a certain limit) may be effected by inserting the coins and operating the carrier H; each payment being indicated upon an annular indicator T fixed to the disc K and visible through the glazed opening C. When, however, the last payment of the predetermined limit has been reached, the rotation of the disc K brings a stop U into a position which prevents any further payment until the mechanism has worked back to the extent of one payment. For this purpose a modified form of a known device is used, consisting of a bar or lever V pivoted to the case and normally occupying a position resting upon a stop across the upper part of the coin slot, as shown in figs. 1 and 2; so that the insertion of a coin necessarily raises the bar. When the stop U is in the position shown in figs. 2 and 3, it is visible through the window C, and prevents the rising of the bar V, and thereby prevents the admission of a coin through the slot B.

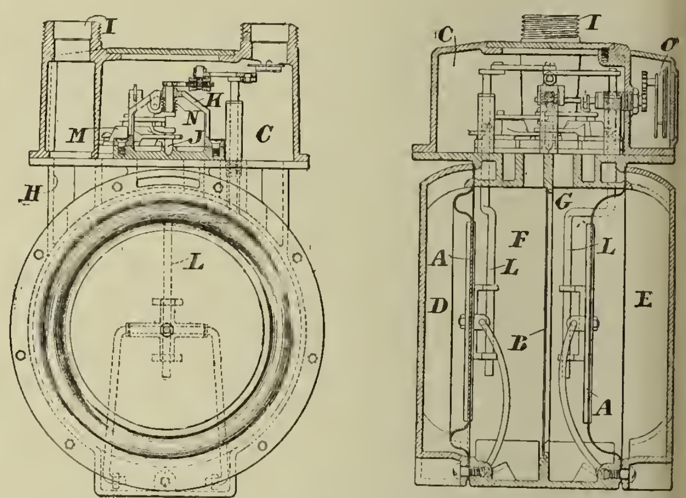
Gas-Meters.

Chrisman, H., of Pittsburg, Penn., U.S.A.

No. 7629; March 30, 1909. Date claimed under International Convention, May 4, 1908.

This invention relates particularly to meters comprising a plurality of aligned measuring chambers and in which reciprocating diaphragms are employed which are actuated by the gas passing through the meter and which in turn operate the distributing valves and the registering apparatus of the meter. The object is to provide a meter which shall be simpler and cheaper to manufacture than those hitherto employed, and "adapted to protect more effectively the mechanism of the meter from interference or injury by unauthorized persons."

The meter consists of an exterior casing formed in four distinct parts—a body portion, two side covers, and a top cover. The chamber enclosed by the body portion and the two side covers is divided into four measuring chambers by two reciprocating diaphragms and a stationary partition. The top cover encloses the distributing chamber from which gas is delivered to each of the four measuring chambers, and it is also provided with the main gas-inlet port and main gas-outlet port, which respectively communicate with the gas-main and the gas-distributing system. The delivery of gas to and from the four measuring chambers is controlled by two slide-valves within the distributing chamber and actuated, in conjunction with the registering apparatus, by the reciprocating diaphragms.



Chrisman's Gas-Meter.

The diaphragms A and the stationary partitition B form the four measuring chambers referred to. Each chamber communicates with the distributing chamber C by means of a passage formed in the walls of the meter body, and through which it receives and delivers gas. The chambers D E communicate with the chamber C through passages, each of which extends through the body portion. The chambers F G, which are similarly located between the diaphragms and the stationary partition, communicate with the distributing chamber through passages formed in the body portion. An exhaust chamber communicates with an exhaust port I formed in the top cover, by means of a tubular duct integral with the top cover, and which projects down into contact with the body portion.

A vertically disposed crank-shaft J is journalled at its lower end in a plate, and at the upper end in a frame K. The valves, the crank-shaft, the frame, and the reducing mechanism for the registering apparatus are all secured to the valve seat plate—an advantageous arrangement, for the reason that the valves are more easily adjusted than would be the case if each valve had an independent seat. Less difficulty is also encountered in maintaining the alignment of the reducing mechanism than would be the case if the frame were independently secured to the body portion. The crank-shaft is rotated by the flag-wires through the agency of flag arms and flag arm links. One flag arm L is secured to the upper end of each flag wire, and a flag arm link is pivotally secured to the outer or free end of each arm. A tangent arm is rigidly secured to the crank-shaft J, and is provided with a standard adjustable longitudinally of the arm and to which the links are pivotally secured.

The distributing valves M are simple "D" or slide valves, which reciprocate on their seats and alternately connect each measuring chamber with the distribution chamber and the discharge chamber. Each valve controls the delivery of gas to, and the discharge of gas from, the two measuring chambers on one side of the partition B, and is reciprocated by the crank-shaft J, through the agency of a valve link pivotally secured to a pin or lug formed on the valve. Each valve is provided with bifurcated projecting arms, which co-operate with a screw so as to maintain the valves in proper alignment during their reciprocations. The flag-wires are so arranged that the crank-shaft will never be dead centred. One measuring chamber is always open to the gas pressure within the distributing chamber C.

A pawl is pivotally mounted on the frame portion K, and, engaging the tangent arm at each revolution, prevents the meter being operated in the reverse direction. The gas-inlet port is provided with a shield secured to the top cover adjacent to the port, and so located as to pre-

vent the operating mechanism being tampered with by the insertion of wires or other instruments through the port opening.

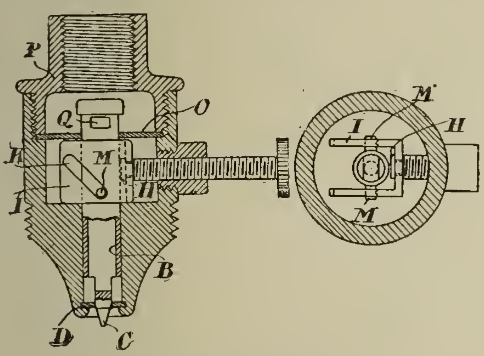
A worm gear N, provided on the shaft above the crank arms, and a wheel meshing with the worm and mounted on a shaft journalled in the frame K, constitute the reducing mechanism of the registering apparatus O.

Gas-Nozzles for Inverted Burners.

Graetz, M., of Berlin.

No. 8149; April 5, 1909.

The object of this invention is to effect the fine adjustment of inverted gas-burners by means of a screw while retaining the positive operation of the regulating organ. Another object is to avoid the one-sided operation associated with eccentrics and other similar devices. A construction embodying these two features consists in a yoke surrounding the regulating pin and provided with inclined slots in which pins engage fixed to the regulating pin; the yoke being adapted to be moved crosswise to the axis of the regulating pin by a screw. The regulating pin is preferably formed hollow, and is provided at its upper end with an opening arranged above a plate through which the hollow pin passes. In this way, the plate acts as a baffle-plate to catch any solid particles carried over by the gas, and the gas (freed from dust) passes through the opening to the interior of the hollow regulating pin.



Inverted Burner Nozzles.

In the accompanying cross section through a nozzle provided with such regulating means, and a plan view of the regulator, the nozzle body is provided with a central opening through which there slides the hollow regulating organ B, at the end of which there is a pointed pin C adapted to enter a plate D arranged at the lower end of the body. The regulator B is provided with two side pins M, arranged diametrically opposite, and projecting into, inclined slots K arranged in a yoke I. With the yoke there engages a screw G, provided with a shoulder H so that the screw may move the yoke positively in either direction. The screw fits in a nut arranged in the nozzle. The yoke is guided between the bottom of the hollowed-out chamber in the body and a plate O, held in position by the nipple P, which screws into the body. Above the plate there is arranged in the walls of the regulator B a port Q. The upper end of the regulator is closed by a cap.

With this device gas enters the nipple P from above, and impinges on the plate O. The regulator B is illustrated in its furthest-in position—that is to say, the pin C practically fills the opening in the plate D, and the pin M is at the bottom of the inclined slot K. In this position, the port Q in B is above the plate O, so that all dust carried over by the gas settles on the plate, and the gas free from dust passes through the port Q. This arrangement therefore dispenses with the necessity of a sieve.

To regulate the nozzle opening, the screw is rotated so as to draw the yoke I (say) from left to right. With this motion, the pins M rise in the inclined slots K and produce the required adjustment.

Leak-Indicating Gas-Meters.

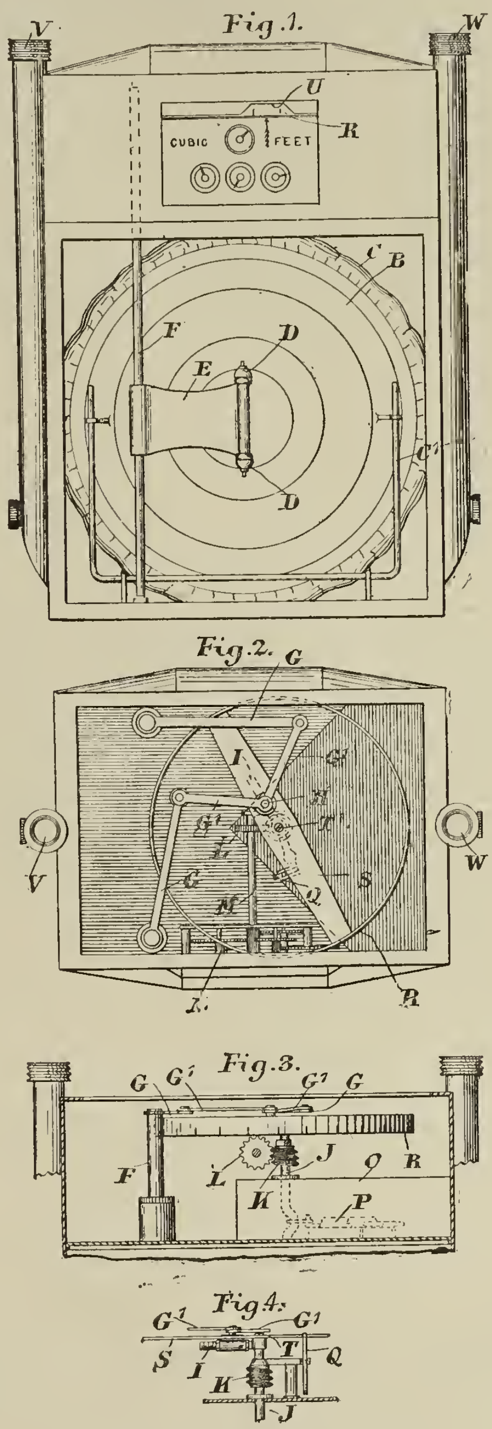
Dezendorf, R. L., of Richmond Hill, New York State.

No. 9866; April 26, 1909. Date claimed under International Convention, May 20, 1908.

This invention has for its object to provide means for quickly indicating whether or not any gas is passing through the meter, "even though the amount may be very small." It is said to be particularly useful in detecting leakage, which, "in the meters now used, can only be detected after a considerable period." The patentee observes: "Thus, when a meter is installed, the requirements are that the person installing it shall not leave it until he is sure that all the connections are tight, so that there is no leakage. If there is a small leakage, it may happen that, on account of the back-lash or lost motion in the registering train, no indication of such leakage will be given on the dial for a considerable period. Furthermore, the movement of the train is so slow that unless the leak is large, it is very difficult to detect it. It frequently happens, for these reasons, that the person installing the meter is compelled to wait a quarter-of-an-hour, or longer, in order to determine, by observing the indicating dial, whether the pipes and fixtures are tight. Furthermore, it is very difficult for anyone to detect small leaks in the fixtures or piping throughout the house, such as are very liable to occur at the stop-cocks and joints. By my improvement, the fact as to whether there are any leaks at or beyond the meter can be readily detected, since the slightest flow of gas produces a perceptible indication within a very short time."

Fig. 1 is a front elevation of a meter embodying the suggested improvement—one of the lower sections being opened by the removal of the front plate. Fig. 2 is a plan view of the meter with the top removed. Fig. 3 is a view of the case in section, and showing certain parts within the case in elevation. Fig. 4 is a detail.

The meter casing has the usual front and back sections, each of which contains a disc B, with the flexible diaphragm C and guide-wires C^1. Connected to each disc are posts D, to which is pivoted the flag E, rigidly secured to its flag-wire F. The flag-wires extend upward through stuffing boxes to the gallery of the meter. Connected to the flag-wires are flag-arms G G^1—G being the upper arm and G^1 the forearm in each instance. These arms are connected at H to the tangent I, which forms a part of the crank-shaft J. The crank-shaft bears the worm K, which meshes with the gear L driving the index-shaft M of the registering train N. The crank-shaft passes into the valve chamber O, and operates the valves P in it. Q is a dog carried by the bridge and engaging the tangent so as to prevent any backward rotation of the driving mechanism.



Dezendorf's Leak-Indicating Meter.

The parts thus far described are "the parts of the standard meter, which has been in common use for many years." To a rapidly moving part of the driving mechanism of this meter the patentee proposes to connect an indicator, preferably describing a circle having a diameter substantially equal to the depth of the meter casing. It is made in the form of a circle R, the connection being effected by a cross-bar S, secured to the crank-shaft J by (say) a screw T, so that the indicator moves in a horizontal plane. The cross-bar may be also secured rigidly to the crank-shaft or tangent I. This indicating circle R rotates behind an opening U, which (for convenience) is placed above the indicating dial of the registering train, so that a portion of it is visible through the casing. It is rigidly connected to the driving mechanism of the meter "and, therefore, eliminates any danger of lost motion;" so that any movement of the driving mechanism of the meter is at once communicated to the circle R. The driving mechanism of the meter always moves at a rapid rate relative to the movement of the shaft M, or any portion of the registering train—the shaft J making fifteen revolutions to one revolution of the shaft M. The large radius of the indicating circle R causes a point on the periphery of the circle to move over a hundred times as fast as any portion of the registering train, and any movement of the operating mechanism is, therefore, easily and quickly detectable by observing the indicator R.

This "quickly moving indicating surface" R is shown connected to

the crank-shaft of the meter, and that is the form preferred. In this form, it should be concentric with the axis of the shaft J. It can, however, be connected to any other moving portion of the operating mechanism within the gallery, so long as "lost motion can be sufficiently eliminated and sufficient speed secured."

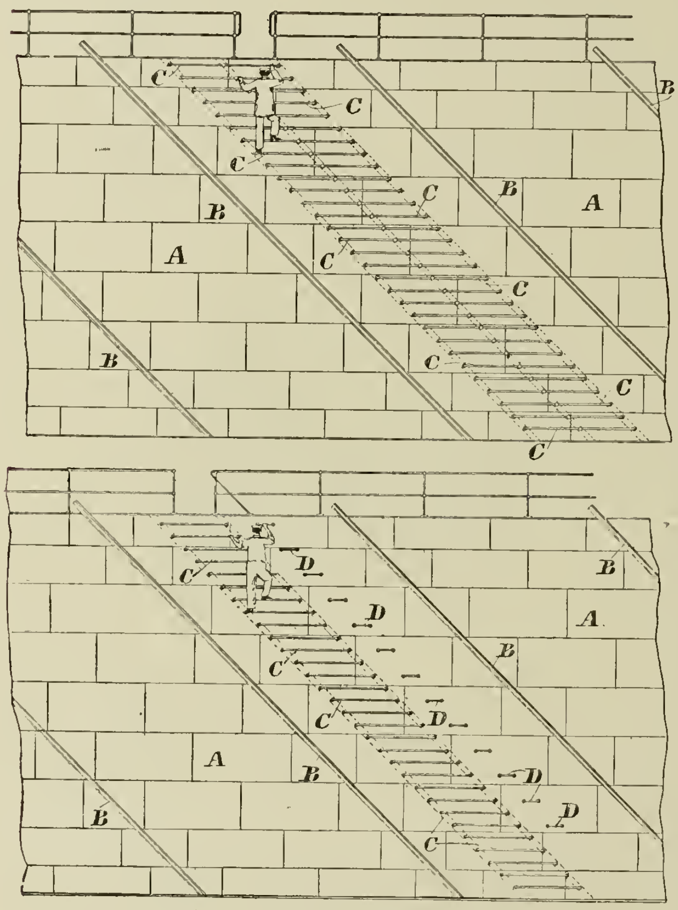
In operation, gas enters the inlet V and passes to the outlet W in the usual manner, causing the diaphragms to reciprocate and the flag-wires and arms to oscillate, so as to turn the crank-shaft J. The slightest movement of the operating mechanism at once moves the graduated indicating circle R in a horizontal plane; and this movement is readily detectable through the opening U. "By this means, as soon as the meter is connected and the gas is turned on, it can be at once ascertained whether there is any leakage on the outside of the meter, either in the coupling or in the fixtures through the house."

Ladders for Use with Spirally-Guided Gasholders.

Wright, H. F. (C. & W. Walker, Limited), of Donnington, Salop.

No. 9483; April 21, 1909.

This inventor applies to the lift a ladder composed of rounds or treads, horizontally disposed but arranged in a series at such an angle, or sideway inclination, as will not be intercepted by a guiding rail. The treads may be applied direct to the sides of the lift, or to side members set diagonally at the required angle instead of vertically. They are of so much greater length than the treads of ordinary vertical ladders as to give the requisite safe footing and handhold for men ascending and descending.



Wright's Ladders for Spiral Holders.

The illustrations show parts of a lift A of a spirally-guided holder to which ladders, in accordance with this invention, are applied. In the first arrangement, the rounds or treads constitute also the handholds; while the second shows a ladder with supplemental handholds fixed to the lift at the side of the ladder. In both figures, B are guiding rails, set spirally as usual. The ladder is made up of treads C, of greater length than is usual with vertical ladders and set sideways of each other in an upward and downward direction; so that they form a diagonally arranged series extending from the lower to the upper part of the lift without any obstruction from the spiral guiding rails B.

In the second illustration, the treads are of less length than those shown in the first one, and are supplemented by handholds D fixed in convenient positions and at suitable intervals along the side of the ladder.

The Explosion at the Hanley Gas-Works.—In the House of Commons last Tuesday, Mr. William Thorne asked the Home Secretary what had been the result of his inquiries with reference to the explosion that took place on the 19th of July in one of the purifiers at the Hanley Gas-Works. Mr. Gladstone replied: I have received a report with regard to this explosion, from which it appears that the purifier in question was last emptied on the 9th of March of this year, and that three quarters of an hour intervened between the lid being lifted and the men entering the purifier. It would appear that a longer interval should have been allowed; and I am arranging for further inquiries to be made as to the practice at other works, and into the subject generally. I may, perhaps, add that the Inspector informs me that 54 purifiers have been dealt with in the same way during the last two years at the Hanley Gas-Works without any mishap.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Dr. Bueb's Experiments on Coal Gasification in Verticals.

Sir,—The very interesting experiments of Dr. J. Bueb, described in his communication, on "The Procedure of Gasification in Vertical Retorts," in your issue of the 10th inst., deserve special attention as confirming in every detail the results of previous investigations on the subject. I think, however, some of Dr. Bueb's conclusions should not go unchallenged; and I, therefore, ask you to be allowed some space in your columns to critically examine this contribution to the problem of carbonization.

That, indeed, the conditions obtaining in a vertical retort were truly reproduced in the experiment described is very much open to doubt. The simple fact that the piece of coke was so inserted in his porcelain tube as to be a good fit, constitutes an enormous difference from the conditions in the retort, where (according to his own observation and general experience) the charge stands-off the wall of the retort at a considerable distance, and presents innumerable cracks and passages for a ready escape of the gas.

The gas—more especially during the early hours of high make, characterized by high pressure—will have a sufficiently rapid rate of flow to pass through these open spaces fast enough to avoid assuming the temperature of the surfaces with which it comes in contact, or to materially suffer from the heat radiating from them. Now, the thermal decomposition of the gas is to a large extent dependent on its rate of flow—a fact which recently has again been so ably demonstrated by Mr. R. Forbes Carpenter. If, therefore, the rate of flow is impeded by forcing the gas through the fine pores of coke only, the conditions are vitally altered from those in the retort.

By this, however, I should not like by any means to infer that a decomposition of the gas liberated from the coal does not take place to a considerable extent. The liberal formation of scurf in intermittent vertical retorts, which has been objected to at various times, would readily disprove such an assumption. I rather suggest that the principal sufferers from the influence of the heat must be those very heavy hydrocarbons which are, firstly, more liable to decomposition, and, secondly, owing to their higher specific gravity, would not travel at the rate of the specifically much lighter hydrocarbons which constitute the coal gas proper. As I must necessarily infer from the available data that Dr. Bueb's experiments were carried out with purified coal gas, free from tar, taken from the laboratory tap, I think his results cannot apply to the real conditions. If it were possible to collect the crude distillate from coal from some point within the charge, and cool it without any change in its chemical composition, and then reheat it in the manner described, I feel certain it would still contain a percentage of illuminants larger than that required in practice, although it would have deposited carbon freely.

I believe that the question of the travel of gases can be brought nearer its solution by positive observation rather than by negative arguments; and the best object-lesson for the former is a close and continuous study of the coke produced. Its structure at various points in the charge is so characteristic that a good deal can be deduced from it by ordinary physical considerations.

If, indeed, the gases would travel through the core of the charge during the whole of the carbonizing period, I should be interested to obtain from Dr. Bueb an explanation as to the formation of bubbles of tar coke in the centre of the charge.

R. Lessing.

Laboratory, 317, High Holborn, W.C., Aug. 21, 1909.

Effect of Motor Traffic on Gas-Main Joints.

Mr. T. Webb, the Manager of the Slough Gas Company, writes: "I shall be glad to know if any of your readers are experiencing trouble with their mains owing to the very heavy motor traffic on the roads; for I find that the vibration from this traffic is seriously affecting our joints. Can any of your readers suggest anything effective to meet the difficulty?"

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Private Bills Royal Assented.

On Monday last week the following Bills received the Royal Assent by Commission: Aldershot Gas and Water Bill, Alliance and Dublin Consumers' Gas Bill, Ammanford Gas Bill, Blackwood Gas Bill, Bungay Water Bill, Clevedon Water Bill, Derwent Valley Water Board Bill, Donington Water Bill, Eastbourne Gas Bill, Frimley and Farnborough District Water Bill, Gaslight and Coke Company Bill, Gas Orders Confirmation Bills (Nos. 1 and 2), Gas Provisional Order Bill, Grantham Water Bill, Harrogate Gas Bill, Heywood Corporation Bill, Lisburn Urban District Council Bill, Llanelly Water Bill, Local Government Provisional Orders (Gas) Bill, Mountain Ash Urban District Council Bill, Musselburgh Gas Order Confirmation Bill, Northallerton Water Bill, Oldham Corporation Bill, Pontypool Gas and Water Bill, Pontypridd Water Bill, Prestatyn Urban District Council Bill, Risca Urban District Council Bill, St. Andrews Water Order Confirmation Bill, South Staffordshire Water Bill, Stourbridge and District Water Board Bill, Swinton and Mexborough Gas Board Bill, Wakefield Corporation Bill, Watford Urban District Council Bill, West Gloucestershire Water Bill, Worksop Water Bill, York Town and Blackwater Gas (Electric Lighting, &c.) Bill.

MISCELLANEOUS NEWS.

LIVERPOOL UNITED GAS COMPANY.

The Half-Yearly Meeting of this Company was held at the Offices, Duke Street, Liverpool, last Tuesday—Mr. H. Wade Deacon in the chair.

The report and accounts for the year ended the 30th of June showed that the sale of gas produced a revenue of £514,377; the rental of meters and stoves came to £16,020; residuals yielded £101,854; and the total receipts were £632,859. The expenditure on the manufacture of gas was £398,384 (coal and oil costing £283,240, and repair and maintenance of works and plant £60,099); on distribution, £56,969; on management, £21,317; the contributions to the officials' superannuation fund and the Company's moiety to the superannuation of old officials came to £4840; and the total expenses were £518,070. The balance of £114,789 was carried to the profit and loss account. After deducting the amount taken for the dividend declared in February and interest on the debenture stock, there remained a balance of £59,409, out of which the Directors recommended the payment of a dividend for the half year of 5 per cent. on the consolidated "A" stock, and 3½ per cent. on the 7 per cent. "B" stock.

The Chairman, in moving the adoption of the report and accounts, referred in feeling terms to the death of Sir Edward Lawrence, who had been a member of the Board for upwards of 33 years, during some 24 of which he was Chairman. Sir Edward's long connection with the Company and his great knowledge of its affairs, together with his genial personality, combined to make him a Chairman in whom everybody had confidence, and for whom all had the greatest respect. Until the last his genial presence was always welcome and inspiring to the Board; and, personally, he should always look back upon his association with Sir Edward in connection with the Company with feelings of the kindest regard. Turning to the report, the Chairman said he was glad to be able to inform the shareholders that the Company had sold practically the same quantity of gas as in the previous year. Comparing the results of the Company and those of other towns, it was gratifying to know that all these places had suffered more than they in Liverpool had done. Bad trade coupled with other causes had undoubtedly had a depressing effect on the consumption of gas. But in spite of this, they had a considerable increase in the number of users; and this was a very satisfactory point. The Board had experienced considerable difficulty with regard to the supply of cannel. Owing to the lamentable disaster at the Maybole Colliery, which supplied them with the bulk of their cannel, their supplies were cut off; and it was, for a time, very hard to maintain the high standard usually observed. Arrangements, however, had been made so that no difficulties would arise in the future. Dealing in detail with the accounts, the Chairman remarked that the cost of coal showed a small decrease of about £1600, and there was a considerable decrease in wages at the works, due to the policy which the Directors had pursued in improving the apparatus. This policy was beginning to bear fruit, and the main aim was still to lower the cost of production. The increase in their rates and taxes was very serious. In two years they had gone up between £5000 and £6000, which was nearly ½d. per 1000 cubic feet sold. Altogether in rates and taxes they paid upwards of £30,000 a year, which meant something like 2½d. per 1000 cubic feet of gas. The income from the sale of gas was £4000 less than in the previous year. This was to some extent due to the fact that the price to users of prepayment meters had been reduced by 2d. per 1000 cubic feet. There was an increase of £477 in the rental of meters, and also of £203 in the rental of stoves. There was a serious decrease in the returns from residual products, amounting to more than £9000. The Board had made special efforts to promote the sale of coke locally, and they thought everybody in the city ought to use Liverpool coke. As far as they could, the Company would do their best to prevent outsiders sending coke from other towns. It was much more natural that they should sell Liverpool coke in Liverpool than that people should use coke sent from Manchester, Birmingham, Sheffield, or anywhere else. The total revenue for the year was £632,859, and the expenditure amounted to £518,070; leaving a surplus of £114,789. After deducting the amount taken for payment of the dividend declared in February, and interest on debenture stock, there remained a balance of £59,409. The Directors, after careful consideration, had come to the conclusion that it would not be possible for them to reduce the price of gas; but, on the other hand, they had decided not to increase it.

Mr. J. Lister seconded the motion; and it was unanimously adopted.

It was then resolved to declare a dividend for the half year ended the 30th of June of 5 per cent. on the ordinary consolidated stock, and of 3½ per cent. on the 7 per cent. stock.

The retiring Directors (Sir William Forwood, Mr. Alfred Fletcher, Mr. James Lister, and Mr. Thomas Case Morris) were re-elected; Mr. Burton W. Eills was reappointed Auditor; and the proceedings closed with a vote of thanks to the Chairman.

SHEFFIELD UNITED GASLIGHT COMPANY.

Half-Yearly Report and Accounts.—Proposed Reduction of Illuminating Power.

In opening their report for the six months ended the 30th of June, which will be presented to the proprietors at the ordinary general meeting of the Sheffield United Gaslight Company on the 6th prox., the Directors state that, bearing in mind that the sale of gas in the half years to June 30, 1907 and 1908, showed increases of 9·33 and 6·59 per cent. respectively, they hardly anticipated that, in the present state of trade, the rate of consumption would be maintained. They are, therefore, gratified to be able to report that instead of a falling off, as might have been expected, there was an increase of 1·23 per cent. in the quantity of gas sold in the period covered by the report, compared with the corresponding six months of last year. The advantage to the Company of the lower price of coal, which cost £8366 less, has been entirely nullified by the reduced receipts for residuals, which show a falling off of £8559. The profit on the half year, including interest on the reserve fund investments, amounts to £38,081. To this must be added the balance brought forward; making a total of £119,524 from which to pay the interest on the debenture stock and the dividend. There will then remain a balance of £74,767 to be carried forward.

The accounts accompanying the report show that the sale of gas in the half year produced £104,110, the rental of meters and stoves came to £9347, residuals brought in £63,968, and the total revenue was £178,574. The expenditure on the manufacture of gas amounted to £108,861 (coal costing £68,175, and repair and maintenance of plant £20,683); distribution, £14,895; and management, £6587; rents, rates, and taxes came to £9979; and the total expenses were £141,890. The balance carried to the profit and loss account is £36,684.

At the conclusion of the meeting, an extraordinary general meeting will be held for the purpose of obtaining the sanction of the shareholders to an application to the Board of Trade for a Provisional Order, to be confirmed in next session, for the following purposes: "To modify the apparatus for testing the quality of the gas supplied by the Company, and to reduce the standard for the illuminating power thereof to 14 candles; to authorize the holding of ordinary meetings of the shareholders annually instead of twice a year as hitherto; and to permit debenture stock to be offered for sale by tender as well as by auction, the Company's powers allowing for sale by auction only."

CROYDON GAS COMPANY.

The Half-Yearly Meeting of the Company was held on Friday, at the Offices, Katherine Street, Croydon—Mr. Charles Hussey, J.P. in the Chair.

The Secretary (Mr. W. W. Topley) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

Growth, and Work of the Distribution Department.

The Chairman, in moving the adoption of the report and accounts, said the half year under review had been, save for the effect on the Company of the prices of coal and of coke, to which he should allude later, a rather uneventful one. The growth of the undertaking had been of a steady and satisfactory nature. Measured by the increase in sales of gas (2·50 per cent.), it had not been so large as they had often had in the past; but this increase, compared with that of many of their neighbours, was a good one. This half year suffered in comparison with a year ago by the extra day in 1908 as leap year. Also the weather in the early part of the winter was relatively mild; and it was a matter of common experience with gas companies that to stimulate the output of gas-fires in winter, they required cold weather in the early part of the season. Later on, people—while realizing the comfort which the possession of a gas-fire would give them—were often inclined to defer installing one till the next winter. Similarly, in the early days of summer, a continued spell of hot weather would lead to a rush of orders for gas-cookers, while a cold early summer, such as they had had this year, tended to induce consumers to hold over their installation to another year; and heat such as had recently been experienced produced only vain regrets on their part. Still, the output of stoves (which represented for the half year an increase of 1400 on the number in use) bore testimony to the excellent work being done in the distribution department and to the good results of the lectures on gas cookery which had been given, coupled with the canvassing work that had been done. When they remembered the regrettably large number of empty houses still in the borough, the increase of 823 in the number of consumers should not, he thought, be deemed unsatisfactory.

RESULTS AND ANTICIPATIONS.

A glance at the accounts with which the proprietors had been furnished would show that the marked features of the half year were, on the one hand, the lessened cost of manufacture, and, on the other, the reduced receipts from residuals. The first was due largely, of course, to the lessened cost of coal; but it was only fair to the very excellent work done in the manufacturing department to tell the proprietors that the improved results at the works had materially contributed to this satisfactory result. The very depressed state of the coke market was the counterbalancing factor; and it would be seen that one about offset the other. The receipts from gas were less by some £3000; and this was due to the reduction in price which took place at Michaelmas last. The actual money gain to the consumers was greater than this, and amounted to over £5000 for the half year. Practically, the reduction in gross profit was accounted for by the lessened receipts from the sale of gas. Contracts for both coal and oil over the coming twelve months had been made on favourable terms; and though the gain from this source would, he feared, be lessened by the still very poor prices of residuals, the Directors hoped, if the prices of coal and oil continued low, they would be in a position before very long to announce a still further reduction in the price of gas.

COAL STOCKS.

It would be noticed that the stock of coal in hand was a very large one. This had been intentionally done as a measure of precaution in view of the very unsettled state of affairs in the mining industry brought about by the Coal Mines (Eight Hours) Act culminating in the recent threat of a general strike. It was hoped, however, that these troubles were now in course of settling down; and that the heavy stocks of coal could soon be with safety reduced. It would be readily understood that it was essential to hold a sufficient stock to ensure the uninterrupted supply of gas.

CO-PARTNERSHIP.

The charge under the heading of co-partnership, which first appeared in the accounts last half year, represented the balance of the first year's

bonus which had been credited to the Company's employees, practically all of whom were, he was glad to say, enrolled under the scheme. A feature of the working in their case, which the proprietors would, he was sure, agree with the Directors in regarding as very satisfactory, was that since the agreements of service had been signed in January last, the amounts deposited by the employees with the Trustees, or saved from their wages and salaries during the six months, exceeded the whole amount of the bonus for the period by about 30 per cent. He should much like to mention here a very graceful act that was performed by the Co-Partnership Committee at their first meeting, when—on behalf of the co-partners generally—they spontaneously asked the acceptance by the Directors of the bust of the late Sir George Livesey which was now on the table; and he should like also to take this opportunity of acknowledging how very greatly the Directors appreciated the cordial feeling which this indicated on the part of the co-partners. It was proposed to place the bust of Sir George (who was the pioneer of co-partnership in the gas industry) in the Board-room as a memento of the adoption of co-partnership by this Company.

FREE MAINTENANCE.

It would be seen from the report that a modification was about to be made in the system under which the Company undertook for consumers the maintenance of incandescent burners. The improvements effected in gas lighting by the development of these burners, both in efficiency and in decorative effect, placed gas easily at the head of all methods of artificial illumination, whether as regarded quality of the light (which had been not inaptly described as "artificial sunlight") or its cost, which was now about one-eighth of that of electric lighting by the lamps ordinarily in use, or one-third of that by the most efficient of the expensive and fragile metallic filament lamps. The fullest benefit and economy to be derived from the use of these burners could only be obtained if they received from time to time the attention they required—mainly clearing out the dust that settled on the burners and impaired their action. Recognizing this, the Directors had for some years undertaken this work for consumers at a fixed price, which had been little more than sufficient to cover the cost of the materials used. Now they proposed to give the attendance absolutely free; and they were encouraged by the experience of other companies who had recently adopted this practice to believe that a largely increased proportion of the consumers would soon avail themselves of the service. This he mentioned as one instance only of the many directions in which gas companies to-day rendered, free of charge to their customers, services which were not needed in the past; and as indicating the growing importance of a strong and well-organized distribution department such as the Directors were pleased to feel that the Company possessed. One further matter he might allude to in this connection. The Company were now offering to fix to consumers' meters free of charge pressure-regulating governors, with the option after trial of purchase, or rental at low rates; and consumers who had these installed would soon find the benefits they brought about in an improved and steadier light, and in lessened accounts.

TAR AND LIQUOR SEPARATION.

It would, he was sure, interest the proprietors to know, in view of the rapidly extending use of tar for the treatment of roads, that their Engineer had so arranged the tar and liquor tanks of the new section as to render more thorough the separation of these two residuals, with most satisfactory results both as to the quality of the tar (which was now very highly spoken of by users) and as to the yield of sulphate of ammonia. The latter, it would be seen, although the price had averaged 12s. per ton less than in 1908, yielded an increase of revenue.

FURTHER CHANGES AT THE WORKS, AND THE CARRY-FORWARD.

The net profit of the half year had exceeded the sum required for payment of dividends by nearly £1500; and out of this sum the Directors had placed £500 to the renewal fund. This was to meet the charges which would have to be borne upon the reconstruction of the workmen's club house and mechanics' shops. The former, which stood as it did when the works were first erected some forty years ago, occupied space which would form part of the coal-store of Nos. 1 and 2 retort-houses, when their reconstruction was completed; and it was proposed to shortly erect for the use of the men a suitably equipped building in a more central part of the works. A like course would shortly be taken with regard to the mechanics' shops; and the space they now occupied would be utilized to effect much-needed improvements in the stores. After paying the dividends, the carry-forward was increased from £5589 to £6552, or practically by £1000.

The DEPUTY-CHAIRMAN (Mr. Thomas Rigby) seconded the motion, remarking that he agreed with the Chairman that, under the circumstances, the report was an exceedingly good one; and he would go further, and give it as his opinion that it spoke well for the future. He had no doubt the result in the coming half year would be quite satisfactory to the proprietors.

The motion was unanimously carried.

Mr. WILLIAM CASH proposed the declaration of the dividends at the following rates per annum: On the "A" stock 14½ per cent., "B" and "C" stocks 11½ per cent., "D" stock 5 per cent., and "E" stock 10 per cent.—all less income-tax. He remarked that the dividend had been thoroughly well earned. Compared with a year ago, they had added £341 to the carry-forward; had introduced co-partnership, which had cost the Company £1244; and they had effected a reduction in the price of gas. The Directors were satisfied with this; and he believed the position would commend itself to the proprietors.

Mr. PERCY H. HALL seconded the motion; and it was unanimously adopted.

VOTES OF THANKS—CONSOLIDATION OF STOCKS.

Mr. MARTIN TAYLOR moved a hearty vote of thanks to the Chairman and Directors.

Mr. A. W. OKE, in seconding the motion, observed that the Directors had been well-advised in having a somewhat large reserve of coal. He was glad to see the Board were looking so well after the consumers, and also that they had adopted the system of free burner maintenance. While they were doing this, they also looked after the proprietors—not only in regard to their dividends, but in warning them against (he might call them) worthless imitations of gas companies. It was unfortunate that innocent investors in gas companies, and motor companies too, were flooded with circulars from unscrupulous persons, advocating investment in these concerns. Some small undertakings might be successful; but in the majority of those to which he was referring, the people who invested in them never saw their money again. The proprietors were pleased to hear of the happy results of the introduction of co-partnership.

Mr. DYER desired to support the motion, in order to give him an opportunity of expressing his satisfaction with the balance-sheet, and with the introduction of co-partnership, and to refer to one or two other matters. One thing that struck him, in reading his paper that day, was as to the uncertainty of the position in the coal world. He feared there would be trouble at the commencement of next year over the eight-hour business; and therefore he thought it would be wise not to reduce the stocks of coal, but, if anything, rather increase them. Another matter that, in his opinion, would be of advantage was the consolidation of the Company's stocks. Besides facilitating work in the office and dealings in the market, it would be better for investment on behalf of the co-partners and for small consumers.

The motion was cordially agreed to.

THE PRESIDENT OF THE INSTITUTION.

The CHAIRMAN, in the course of his reply, stated that the question of the consolidation of the stocks had had the serious attention of the Board. They were fully aware there was an advantage in consolidating stocks—making one class of them. He could assure the proprietors that, at the first opportunity, when the Board thought it desirable to do so, it would be done; and he believed he might say it would be at no distant date. Moving a vote of thanks to the officers, staffs, and workmen, he remarked that they had all put their best service into the work during the half year. Speaking of the Engineer and General Manager, he mentioned that honours had been showered on Mr. Helps. For many years he was the Hon. Secretary of the Southern District Association of Gas Engineers and Managers, and then he was elected President. In June last, he was placed at the very head of the gas industry of the country, when, at the annual meeting of the Institution of Gas Engineers, he was elected President. [Applause.] It was one of the greatest honours that any man could receive in the gas profession; and Mr. Helps had thoroughly deserved it. Their congratulations were held out to him that day. Mr. Caddick—Mr. Helps' right hand at Waddon—was always found at his post, and doing his duty well. Mr. Topley was never better pleased than when hard at work. The same applied to Mr. Anderson, the Assistant-Secretary. Mr. Sandeman continued to show the greatest interest in the outdoor or distribution department. Since he was appointed, the efficiency of the department had improved immensely. The head of the rental office (Mr. Haines) also did his very best.

Mr. SAMUEL SPENCER seconded the motion; and it was heartily carried.

Mr. HELPS, in reply, thanked the Chairman for the kindly terms in which he had brought this resolution before the proprietors, and the proprietors for the gracious manner in which they had received it. He appreciated greatly the remarks that had been made from the personal point of view. As to the work at Waddon, one felt he was moving among friends, and among men who were not working merely for a weekly wage, but because they took a lively interest in the Company. The little presentation the co-partners had made to the Directors was one that had been subscribed for in small amounts. The suggestion came from the men in the first instance; and practically every employee had given his mite towards providing the sum necessary to purchase the bust of Sir George Livesey—the great man who was practically responsible for adapting the co-partnership system to gas companies.

Mr. TOPLEY, in also replying on behalf of himself and his staff, especially thanked the Chairman for his references to those who shared with him the work for which he was responsible. The words that had been spoken of them were in every sense deserved.

WANDSWORTH AND PUTNEY GAS AND COKE COMPANY.

The Lowest Price Gas in London and the Suburbs.

The Half-Yearly Meeting of the Company was held last Tuesday, at the Offices, Fairfield Street, Wandsworth—Mr. HENRY E. JONES in the chair.

The SECRETARY (Mr. Chas. W. Braine) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The CHAIRMAN, in moving their adoption, said the most important point for him to observe in his comments on the report was, of course, the reduction in the price of gas to a figure that had attracted the attention of their friends. Only the other day, at a Board meeting, a gentleman addressed him as "Mr. One and Elevenpence." But when he (the Chairman) suggested the probability of the price coming down to 1s. 10d. in the not distant future, there was an end to the friendly levity. The next point was that the Directors did not intend there should be this reduction of price without giving the proprietors the extra dividend to which they were entitled under the sliding-scale. The reduction of the price of gas by 1d. per 1000 cubic feet gave the consumers, in the aggregate, £2269; but the little addition to the dividend which a parsimonious Legislature allowed the proprietors to take in consideration of the reduction, only amounted to about £213. So that the proprietors would see the profits were divided in an extremely unequal and unfair proportion—in fact, in their case, only one-eleventh part went to the proprietors, while the whole of the rest went to the consumers. Another point of great consequence to a gas company was the increase in the sale of gas. It had amounted in the six months to 3·1 per cent. compared with the first half of last year, which, contrasted with their neighbours, was a good record. As would have been seen from the figures he had quoted, the reduction in the price of gas and the increase proposed in the dividend

together represented £2482. He ought to say that there was some little dissatisfaction on the part of the Board that they had not on this occasion earned this extra sum of money. But upon reflection the Directors were somewhat consoled. It would not have looked strictly decent (the Directors liked to preserve an air of propriety in all their transactions) to have made such a reduction in the price of gas—a price that excited the envy and the admiration of their neighbours—and then to have earned the full maximum dividend. Instead of giving them £2482—the amount represented by the reduction and the extra dividend—the accounts only gave them £1900 more; the profit on the half-year's trading having been £13,544, against £11,645 in the corresponding period of last year. So that it would be seen they were really short of the amount required to pay the higher dividend by £352. This amount would be drawn from the balance brought forward; and this would still leave them with the fairly substantial sum of £7046. He should explain that the amount required for dividend was more by (omitting shillings and pence) £426—£213 representing three months' dividend on the new stock; and the remainder the £213 to which he had alluded as being required under the sliding-scale. However, the consumers would not have gas at this price, nor would the proprietors have these good dividends, if the Directors did not look after the capital account. The proprietors would be interested in noticing that only one small item had been added to capital on account of fixed plant and land. This was £518, which was the price of a piece of land near the present works, which would some day be of convenience to the Company. The rest of the capital expenditure (which only amounted to £2811) was for those mains, service-pipes, meters, stoves, and coin-meters and fittings without which they could not accomplish a 3½ per cent. increase in the sale of gas. As to the half-year's revenue, owing to the diminished value of residuals and the reduction in the price of gas, they would not make such a large income by, in round figures, some £900. The receipts for gas were about £600 less; but owing to the extended use of stoves, meters, &c., the rentals reduced the net loss to only £60. Residuals produced £827 less, chiefly owing to the fall in the price of coke; but an increase in tar gave them a little compensation. Inasmuch as they had, despite the reduction of price and the additional sum required for dividend, got to within £300 of the amount of profit required, it would be seen that they had saved something. In fact, they had saved practically the whole of the loss in income by the reduction in the price of coal; and this was what gave them such a good account. The total expenditure was less by £2791; but they had had to pay less for coal by about £3600. Oil also showed a small saving. A feature that was not quite so satisfactory was the carbonizing bill. Here their Engineer must look out very sharply, because wages were much in the air just now. The item amounted to £5021, as against £4625—practically £400 more. Still they had sold an additional 3½ per cent. of gas; so that he did not say the difference was altogether a loss. Nevertheless, their Engineer would have to devote himself to this point, because it was found that, with a suitable charging-machine, their old and revered friend the horizontal retort (to which he had always been attached), when rammed full of coal and worked for longer periods, would produce certain manufacturing advantages. He did not suppose that, in their case, this would save them a large quantity of coal, because they had never been in the habit of wasting coals in the past, so they could not save now what they had not wasted hitherto. With regard to the other points in the management, he need only say that the charges were as nearly as possible level with last year. He considered that last year they were first-rate; so that he was not going to apologize for them now. In a haphazard and somewhat disjointed fashion he had told the proprietors the history of the balance-sheet; one of the most satisfactory features about it being that the Directors were able to recommend an additional ½ per cent. dividend.

The Deputy-Chairman (Mr. T. A. Ives Howell) seconded the motion, which was unanimously adopted.

Moved by the Chairman, and seconded by the Deputy-Chairman, dividends were declared, less income-tax, on the "A" consolidated stock at £8 2s. 6d. per annum, on the "B" stock at £6 12s. 6d. per cent. per annum, and on the ordinary "C" stock at £5 13s. 9d. per cent. per annum.

The Chairman, in moving a vote of thanks to the Secretary (Mr. Braine), the Engineer (Mr. H. O. Carr), their staffs, and the workmen, remarked that their officers were proud of the 1s. 11d. price. Now what their Engineer had got to do was to get the carbonizing wages per 1000 cubic feet down to 1½d., which was all that was going to be allowed by authorities for carbonizing labour in the future. When their officers succeeded in doing this, then they should have their reward.

Mr. E. L. Burton seconded the motion, which was unanimously carried.

Mr. Braine and Mr. Carr having acknowledged the motion,

Mr. Burton proposed a vote of thanks to the Chairman and Directors. He remarked that everybody acquainted with the Company must be fully alive to the fact that the wonderful position it occupied that day was due in large measure to the Chairman. To achieve a price of 1s. 11d. for gas for ordinary consumers was indeed a marvellous record. The South Metropolitan Company were down to 2s. 2d., and had been down to 2s.; but the Wandsworth Company—a much smaller concern—had reduced their price to 1s. 11d. It was a most notable achievement, and reflected the highest credit on the Chairman, Directors, and the staff. He had been comparing the accounts for two or three half years; and he found they stood out in strong contradistinction to many companies—particularly in regard to low costs.

Mr. John Hennell seconded the motion; and it was heartily agreed to.

The Chairman, in his response, said it was gratifying to receive the commendation and appreciation of one so competent to judge as Mr. Burton. There was a further point to which he should like to refer. Just recently, the Directors put up to auction £15,000 of ordinary "C" stock; and they had some question with the auctioneer as to the reserve price that should be put on it. He (the Chairman) had told the proprietors over and over again at these meetings that they did not know the value of their holdings; and the transactions showed that they were throwing stock away. The Board put a strong reserve price on the stock offered by auction; and every shilling of it went. After this, if they could not sell stock at a good reserve price on a future occasion, then they would place it among their own proprietors at a high price. The Stock Exchange quotation for their "B" stock the other day was at a figure that would return to the buyer £4 12s. 3d. per cent.; while in February it was at a price that would return 5 per cent. on the investment. There ought to be no company in London who should be able to sell their stock to bring in as low a rate of interest to the buyer as this Company. Of this he had not the slightest doubt, as there was nothing to touch it.

GAS SUPPLY IN NORTH LONDON SUBURBS.

The Directors of the North Middlesex Gas Company will report to the shareholders at the half-yearly meeting to-morrow that the sale of gas in the six months ended the 30th of June showed an increase of 1,932,200 cubic feet, or 2·1 per cent., compared with the corresponding period of last year; and that, notwithstanding the reduction of 2d. per 1000 cubic feet in the price of gas which took effect as from the 31st of March last, the revenue from gas, meters, stoves, and fittings was greater by £237. The returns from residuals also improved. The accounts show that the sale of 93,008,600 cubic feet of gas produced a net revenue of £16,691; and the total receipts amounted to £20,390. The expenditure on manufacture of gas was £10,107; on distribution, £3253; and on management, £1149—the total expenses being £15,888. The balance carried to the profit and loss account is £4502; and the amount available for distribution is £7111. The Directors recommend dividends at the rates of 5, 10, and 7 per cent. per annum on the preference, original, and additional capital, and the carrying of £473 to the reserve fund. This appropriation will amount to £3665, and leave a balance of £3446 to be carried forward.

The accounts presented at the half-yearly general meeting of the Southgate and District Gas Company last Thursday showed that the sale of gas in the six months ended the 30th of June had increased by 7,986,900 cubic feet, or 12·45 per cent., compared with the corresponding period of the past year. The quantity sold was 72,121,400 cubic feet, and the revenue therefrom was £13,044. The total receipts amounted to £16,269, and the expenses to £12,799; leaving £3470 to go to the profit and loss account. After providing for interest charges and transferring £100 to the insurance fund and £250 to the renewal fund, there was a balance of £5584, out of which dividends at the rates of 5, 10, and 7 per cent. per annum on the preference, original, and additional capital were declared. These absorbed £2731, and left a carry-forward of £2853.

BROMLEY AND CRAYS GAS COMPANY.

A Return to Normal Conditions—Rating Valuers' Practices.

The Half-Yearly Meeting of the Company was held on the 12th inst., at the Offices, No. 156, High Street, Bromley, Kent—Mr. Alexander Dickson in the chair.

The Secretary (Mr. H. W. Amos) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The Chairman, in moving their adoption, said it was a relief to find—after the burden of similar duties in the immediate past, by reason of the exceptional, diverse, and important matters then claiming their attention—that the business of these meetings had again resumed its normal character, and that consequently his observations would be fewer, and the dispatch of the business facilitated. He was pleased to be able to say that the accounts were, and (he was sure the proprietors would agree in this) would remain, satisfactory while they continued to provide, as they did concurrently with concessions in price to the consumers, for the continuance of the dividends as before, and enabled the Directors to defray the contributions from revenue for the subsidiary works required for the unification at Bromley of the manufacture of gas for the whole district, which, it would be remembered, he told the proprietors at the last meeting was absolutely essential. He was pleased to add that it was now being expeditiously effected, and would be practically completed before their next half-yearly meeting. To invite the proprietors to follow a detailed comparative analysis of the past half-year's accounts and those of the corresponding period of last year would only tend, he feared, to confuse them, because they would not have the figures of the working of the two separate Companies before them. But he might summarize the results in this way: Owing to the reduction of the price of gas at Lady-day, 1908, by 2d. per 1000 cubic feet in the then Bromley district, a net lesser rental from gas had been received by some £1300. And coke, from lower prices principally, had yielded less by some £1100. Then from other sources, they were benefited by some £600; so that the net income was about £1800 smaller in the total from the causes to which he had referred. Then, happily, their net total expenditure was also less by about a like amount, though only £1000 of the saving accrued from the saving in coal. While many of the payments in last year's accounts in respect of the amalgamation disappeared, the charges for repairs, maintenance, alterations, &c., of works and plant in the present accounts were correspondingly larger. In the end, after making provision for a continuance of the same rates of dividend on the several classes of capital, they carried forward in the balance of undivided profit an additional sum of £50. The balance would now stand at about £2250. Satisfactory as this was, the Directors, of course, hoped in the year now before them to attain to still better things. The Board had succeeded in effecting some favourable contracts for coal for the current year's requirements. It would be remembered that in the last two years they had been using in part Yorkshire coal of the best quality and Durham coal, rich in the yield of gas, and both high priced coals. The results generally were quite satisfactory; and, so long as ordinary Durham coal commanded top prices, it was advantageous to the Company to keep to these collieries. But as prices moderated, it became obvious that Yorkshire coal would have to give place, as the freight charges of the railways were, in the

altered market prices, too onerous, and the relative prices of the special and the ordinary Durham coals would necessitate resort to the latter. The coals the Directors had bought would come from collieries of high repute; and they believed that their modern excellent plant, in combination with the skill, care, and devotion of the officers and employees, would obtain from them the best results they could be made to yield. Common prudence necessitated the provision of coal in stock. The threatening cloud was said to have disappeared. The whole nation hoped it had. But, of course, they had now to use all this high-priced coal before reaping the full benefit of the new contracts. And so, while every penny per 1000 cubic feet represented £1500 per annum on the present consumption of gas, the Directors had decided to make a reduction of this amount as from Midsummer, which would lower the price of gas in the Bromley area to 3s., or to within 1d. of the lowest price the Company had previously reached, and in the Crays section to the actual lowest price at which gas had at any previous time been supplied in that district—viz., 3s. 6d. In the early future, the difference in price would be diminished in accordance with the statutory scale, which provided for a uniform price over the whole district in ten years from the passing of the Act, if not reached earlier; and, as soon as it had equalized dividends and prices for gas, might thereafter be varied as the sliding-scale permitted. Readers of the reports of other gas authorities would have noticed that, notwithstanding the cold and dull spring, there had been little additional gas taken, though the number of consumers had become larger. Their own experience had not been exceptional; the advantage in the old district being counterbalanced by a slightly diminished consumption of gas in one or two public institutions in the other district which had embarked upon schemes of electric lighting not previously available to them. Yet the total make of gas was 209 million cubic feet, against the 210 millions of the two Companies in the like period of last year, which was practically of small consequence. Then, as to one other matter referred to in the first paragraph of the report. The alteration and increase of the assessments of the Company to the local rates was none the more acceptable because unavoidable from time to time if the increasing volume of business was remunerative to any extent. The attempted departure from the principles established in precedent over a long period of years, observable in the method of valuation adopted by some surveyors retained by the local authorities, pointed to the desirability of a combined effort on the part of gas companies, to assess whose properties, not on their structural rent value as in the case of ordinary householder ratepayers, but upon the estimated sum which an adventurer would be willing to give to enjoy the estimated trade profits of the business, less the landlord's outlay in repairs, these valuers were specially appointed every five years, while other property might be allowed to escape revision for a long time, if not altogether, without any such professional re-survey. To drift into practices varied by every new comer, and without a recognized precedent system to define deductions and allowances, would be extremely undesirable, and likely to create many injustices, because of the great expense to individual companies in carrying a contest before the highest tribunals. If an old precedent was to be discarded, the new one should be unmistakably substituted by judical authority, for the promotion of uniform and equitable ratings in these cases of such great technical perplexity. He thought this was all he would remark upon the result of the revaluation. It had practically determined the rating for the period for which the authorities might allow the assessment to stand, or until changes in the position of the Company might suggest to the Board the desirability of asking for a revision.

The Deputy-Chairman (Mr. Bertram H. Latter) seconded the motion.

Mr. J. Arnaud expressed the view that the invested reserve fund should be calculated half year by half year at the market price of the day.

The Chairman, on the other hand, thought it was not in their case necessary. The Board had considered the matter; and in view of the fluctuations—depreciations and appreciations—from time to time, they did not see any advantage was to be gained. The purpose for which the fund was applicable was specially restricted, and not imminent; and so the investments were allowed to stand at cost.

Mr. Peill protested against the way in which the Directors had in the report painted black the rating authority. He thought the authority had met the Company and everyone else in a very fair way, and had dealt with the matter in an impartial manner.

The Chairman said he supposed he must recognize that the honourable proprietor was speaking somewhat in another capacity. [Mr. Peill: I am, Sir.] That being so, he would take the opportunity of asking Mr. Peill to read the paragraph of the report as it stood, and to be kind enough not to read into it some of the suggestions with which he had been embellishing it. The Directors had only in the paragraph stated the simple facts for the information of the proprietors, in order that they might know there would in future be some £600 more to pay in rates, and how this arose. The Board had simply told the proprietors that the authorities increased their assessment; and that upon the sustained objections of the Company, it had been substantially reduced, but an increased contribution to the rates of £600 a year was entailed by the Committee's decision. That was stating the result in a modest way, without any insinuation whatever against the authorities. The succeeding clause of the paragraph stated that "these additional imposts, so immediately after the amalgamation, derange the efforts of the Directors in cheapening the sale of the gas." That was, again, a statement of fact. The Company would have to provide now, in the first period of five years out of the ten years in which they were to bring about a uniform price over the whole district, an additional £600 of expenditure which they did not contemplate when they got their Bill through Parliament. As between the Company and the rating authority, the Directors quite appreciated the duty incumbent upon the authority; but the Directors would appreciate it all the more if the authority would be good enough to apply somewhat of the same professional examination and inquiry into some of the other existing assessments from time to time, so that there might be a more general lifting up of those which might be properly so treated, and in that way a more equitable incidence of the rate. The Board appreciated the courtesy of the spirit in which the authorities had, on this and former occasions, met them; but his remarks from the chair that day were engendered from a review of the mode of valuation—the difference between the two valuers resulting from a variation of practice on the part of the authority's valuer, as compared with the precedent all such companies had been observing for the past thirty or forty years.

The motion was unanimously carried.

Proposed by the Chairman, and seconded by Mr. A. S. Gedge, dividends were declared at the rates per annum of 6 per cent. on the "A" ordinary stock, of 4½ per cent. on the "B" ordinary stock, and of 5¼ per cent. on the "C" ordinary stock, all less income-tax.

The thanks of the proprietors were passed to the Chairman and Directors and to the Chief Engineer (Mr. W. Woodward), the Secretary (Mr. H. W. Amos), the staff and employees generally.

ALDERSHOT GAS AND WATER COMPANY.

Enlarged Responsibilities and Capital Increase.

The Half-Yearly General Meeting of this Company was recently held at the Offices—Mr. A. F. Wilson in the chair.

The General Manager and Secretary (Mr. R. W. Edwards) having read the notice convening the meeting, the report and accounts for the six months ended the 30th of June were presented. It was stated by the Directors that the working in the six months ended the 30th of June had resulted in a surplus of £7880; and after providing for dividends on the preference shares, they recommended a dividend at the rate of £11 19s. per cent. per annum on the "A" shares, £8 19s. per cent. per annum on the "B" shares, and £7 per cent. per annum on the ordinary "E," "F," and "G" shares for the past half year, all less income-tax. They said the weather during the latter portion of the half year had been unseasonable, and had undoubtedly retarded the use of gas, especially for cooking. This, together with the economies still being obtained by the War Department in the adoption of incandescent burners in the barracks, had somewhat affected the aggregate sales, which nevertheless showed on private consumption an increase of 3·8 per cent. The market for residuals had also been depressed; and consequently the revenue under this head was rather lower. The results, however, were satisfactory, especially taking into account the considerable reductions in the price of gas which had operated over the half year, representing a loss of revenue equivalent to nearly £800, or approaching the rate of £1600 per annum. The Company's Bill to confer additional powers had passed through practically all its stages at the date of the report (July 9); and it has since received the Royal Assent.

The Chairman, in moving the adoption of the report, dealt first with the working in the past half year, and then went on to allude to the increased responsibilities which would devolve upon the Company in the future. He said they had undertaken the supply of gas for a very large territory. In fact, it seemed that for a company such as theirs to be supplying gas to a territory 20 miles distant from the works was nothing out of the way. They at present sent gas into districts 12 and 13 miles from the works without any difficulty; and they did not see why they should not be able to undertake the supply even to the extreme distance he had mentioned. They had also been able to secure for almost the entire portion of the district, with the exception of Aldershot, a monopoly for the supply of electricity. They applied for powers to do this, not with any underhand idea of pushing gas to the detriment of electricity, but only to do honestly and fairly what was intended by Parliament when it granted such monopolies. At the same time, they would be able as a Gas Company to see that what electric light was required and what was really a necessity would be available; and they would make their calculations so that whatever supply was given would yield a fair and reasonable return such as Parliament intended. With this proviso and safeguard, he had no doubt whatever that when the time came they would be able to meet all demands of the prospective electric light community, and at the same time be able to show them that they had not done it to their detriment as a Company. Having referred to the question of consolidating the shares of the Company, the Chairman alluded to the possibility of an increased demand for gas for use in aëroplanes. He said they had reason to hope that the Government would take up the question in a serious manner, and they believed they would establish their aërial headquarters at Aldershot. This, he thought, would be a source of increase in the consumption, because gas would be wanted, and it was available and very cheap in Aldershot. They sold their gas to the Government at a very low rate—much lower than that at which they could get it anywhere else; and he could assure any enterprising manufacturer that if he came to Aldershot he would receive a supply of the cheapest motive power to be obtained anywhere. In conclusion, he acknowledged the assistance the Company had received from local Councils and the Press in connection with their Bill.

The Deputy-Chairman (Dr. F. Stroyan) seconded the motion; and it was carried unanimously.

A vote of thanks having been accorded to the Chairman, Directors, and staff for their able conduct of the Company's affairs,

Dr. Stroyan and Mr. W. T. Robertson acknowledged it. The latter said he should like to thank the staff and their able leader, Mr. Edwards, who, of course, had had to bear a great deal of the brunt of the Bill, which was entirely Mr. Edwards' own in every single detail. The Directors knew what they should like, and their General Manager ably put it into clauses, and finally into the Bill, with the assistance of their lawyers.

Mr. Edwards, also acknowledging the vote, said the Bill was a very important measure—one which reconstructed the Company, and made it the first Company in the country holding treble powers in gas, water, and electricity. They would endeavour to administer the treble powers as fairly as possible, without injuring one or the other. They intended to develop the new districts wisely for the benefit not only of the shareholders but of the districts themselves.

At the close of the ordinary meeting, a special meeting was held, at which the Directors were authorized to issue £25,000 of share capital, *plus* one-third loan capital, under the provisions of the Company's Provisional Order of 1903.

BOURNEMOUTH GAS AND WATER COMPANY.

Directorial and Secretarial Changes—A Larger Carry-Forward.

The Ordinary General Meeting of the Company was held on Friday, at the Company's Offices, No. 90, Cannon Street, E.C.—Mr. G. Crispe Whiteley in the chair.

The Secretary (Mr. H. A. Plumb) read the notice of meeting; and the Directors' report and the accounts were taken as read.

The Chairman said, in laying before the proprietors the accounts for the past half year, and in proposing the reception and adoption of the Directors' report, his first words must be to pay a tribute of respect to the memory of one who had left their ranks, and was no longer with them. Mr. Rymer—Alderman Rymer, as they were wont to call him, in recognition of the excellent public work which he did in his own district—was a member of the Board for more than eleven years. He was a regular attendant at the meetings, and did his work in a quiet and useful way. He (the Chairman) could not remember during the whole of the time that he was with them, a single hard or harsh word that he used towards anybody with whom he was brought into contact. It was a pleasure to work with him. He was kindly and courteous; and the Board had lost a gracious colleague, and the Company a good Director. In filling up the vacancy upon the Board, the Directors had taken an action, which he was sure would, in due course when the matter came before the proprietors, meet with their full approval. The Company was formed in 1864; and during the 45 years of its existence, it had only known two Secretaries—father and son; the late Mr. William Cash having been Secretary for 27 years; the present Mr. Cash having held the office for 18 years. During this period, they had received from their friend services far beyond the ordinary work of a Secretary. Mr. Cash's unrivalled experience in gas accounts, and his general knowledge in gas affairs, had always been placed at the disposal of the Board; and they had felt that the time had come when it would be right to invite Mr. Cash to leave the post he had so long adorned, and take the responsibility of a seat upon the Board. Mr. Cash took time to consider the matter. Sentiments had to be conquered. So far as the emoluments were concerned, the change was in the nature of an Irishman's rise; and there were, of course, legal difficulties to be considered. But, in the end, Mr. Cash had accepted the position; and he (the Chairman) very sincerely congratulated the Company upon this addition to the directorate. He need not say that all the necessary legal steps to isolate Mr. Cash the Director, from Mr. Cash the well-known member of the firm of Cash and Stone, had been taken; and he could only hope that they would long have the benefit of his services in his new position. Now they had the vacancy of Secretary to fill; and here the task had been extremely simple. As no doubt the proprietors were aware, Messrs. Cash and Stone had by arrangement provided the Board-room and London staff throughout the Company's career. This would continue. In Mr. Plumb, they had a gentleman who had been conversant with all the affairs of the Company for the last 32 years, who had been 20 years in the same firm as their late Secretary, and who, he was sure, would worthily maintain the traditions of the office. The proprietors would be asked to approve of the appointment, the terms of which were similar to those held by Mr. Cash. Coming to the accounts, although it had been his pleasure and pride to offer on many occasions most satisfactory statements with regard to the half-year's working, he doubted very much whether they had ever had a better one than on the present occasion. If he were tempted to use the popular phraseology of the day, he might call it a "record." Notwithstanding that they had recently reduced the price of gas by 3d.—a reduction synchronizing with the increase of the price of electricity—and although the price of residuals had decreased, and they had placed in the past year more than £1600 to the co-partnership scheme, the accounts had recovered themselves. They were paying increased dividends, and were carrying forward a larger reserve. Facts and figures were more eloquent than words; and he did not think that any words of his were needed to emphasize their satisfactory position. The co-partnership scheme had been launched most satisfactorily; and as the proprietors would see, they were paying the first bonus of £1608. They had 389 co-partners—practically all who were qualified to join the scheme; and they were receiving an average of £4 2s. 8d., in addition to which 24 of them had already shares in the Company. This, of course, was a small beginning; but it was a good one. He had already had the pleasure of addressing the combined staff, collected together on three occasions; and he wished the proprietors could have seen the eager enthusiasm with which they had entered into the new departure, their full recognition that their own prosperity was included in that of the Company, and their manifest loyalty to their chief, Mr. Harold Woodall. So far with regard to the past; now with regard to the future. The Directors had given the proprietors improved dividends; thay had reduced the price of gas to the consumers; and they had remembered the staff. In continuing the work, they must ever bear in mind what had often been said from the chair, that the interests of all were identical; and the stability of the institution depended upon the due recognition of this fact. The Company were now engaged in duplicating some of the trunk water-mains, and in enlarging others, to keep pace with the steadily increasing requirements of the consumers. He had kept his *bonne bouche* to the last. The proprietors had seen how, during the past year, the reduction in the price of gas had been followed by increased business; and although it was dangerous to prophesy, he had the authority of the Board for saying that, should the business increase as it had done lately, and should no untoward circumstance interfere with their plans, they might reasonably hope to see another decrease in the price of gas in the immediate future. The proprietors would thus see that the Board were carrying out the traditions of the past in considering the interests of all concerned; and he was justified in saying that the same policy which had brought the Company into such a satisfactory position would enable them to maintain their position, and, if possible, to achieve yet higher results in the future.

Mr. R. Hesketh Jones, in seconding the motion, fully endorsed the views of the Chairman as to the satisfactory prospects of the Company.

The motion was unanimously carried.

The Chairman proposed the declaration of dividends, less income-tax, for the half year, at the rate of 6 and 7 per cent. per annum on the preference and "B" ordinary shares respectively, and at 15 per cent. per annum on the original share capital.

Mr. William Cash said he was very glad to have the opportunity of seconding this motion for the first time, when the Company were paying on the original shares a somewhat higher dividend than hitherto, though not the maximum dividend under the sliding-scale. He was sorry Mr. Corbet Woodall was not present; but they all knew what a hard-working man he was. He was taking a well-earned holiday in the North of England, and did not think, with such a report as this, anything contentious would arise at the meeting. Therefore he decided not to return to London specially on this occasion. The proprietors all knew the value of Mr. Woodall's services; and, in that sense, they regretted his absence. As the Chairman had made special reference to him (Mr. Cash), perhaps the proprietors would allow him to make two or three further remarks. He should like to thank the Chairman for his kind personal words. As he (Mr. Cash) had said on previous occasions, his work in connection with the Company had always been a pleasure; and he valued very highly the experience he had gained, through this Company, in connection with gas and water matters. He should also like on this first opportunity in his new position—a position he was proud to hold—to express his thanks to the present Board and to their predecessors for the extreme kindness and the appreciation he had always received in the conduct of the Company's affairs so far as they had been in his hands. The Company had achieved a considerable amount of success; and it was due, in very large measure, to the care and the skill with which its affairs had been managed by the gentlemen who had from time to time sat on the Board. He greatly appreciated the honour conferred upon him in asking him to take a seat on the Directors' side of the table. The Directors from the first had worked very hard in the interests of the undertaking, and had evinced deep concern in carrying on the business—a tradition that had been maintained by their revered Chairman that day, who actually had no business to be there at all. He had been extremely unwell; and it was only his sense of duty that had brought him to the meeting.

The motion was unanimously agreed to.

The Chairman proposed that the salary of the Secretary, as fixed by the Directors—viz., £900 per annum, including the provision of office accommodation and clerical assistance—be approved.

Mr. Hesketh Jones, in seconding, remarked that the remuneration was precisely the same as had hitherto been paid to Mr. Cash.

The proposition was heartily passed.

Mr. Hesketh Jones moved a vote of thanks to the Engineer and General Manager (Mr. Harold W. Woodall), to the Secretary, their respective staffs, and the workmen.

The Chairman, in seconding, remarked that the position of the Company was due to the cordial co-operation of the whole of the staff; and he heartily congratulated Mr. Woodall upon the state of the Company's affairs.

The motion was unanimously agreed to.

Moved by Mr. F. H. Pilley, and seconded by Mr. J. C. Benwell, the Chairman and Directors were thanked for their services.

The Chairman having responded,

Mr. Harold Woodall thanked the Chairman and Mr. Jones for their kindly remarks as to the officers and the employees, who did most thoroughly appreciate the benefits they secured by serving under such a Board and Company. This was an exceptional occasion; and perhaps he might be permitted to say that the officials would have felt they had suffered a great loss if so admired a colleague as Mr. Cash had left them entirely. It was certainly welcome news when they heard that Mr. Cash was to be one of the Directors in future; and they were proud their association with him was to be continued.

Mr. Plumb also replied, and at the same time thanked the proprietors for confirming the Directors' resolution as to his remuneration.

PROVINCIAL GAS COMPANIES.

A Good Increase at Bridport.

At the general meeting of the Bridport Gas Company, Limited, last Tuesday, the Directors reported that the sale of gas continued to show an increase; being nearly 2 million cubic feet, or about 8½ per cent., greater than in the year ended June 30, 1908. The total quantity sold was 25,169,700 cubic feet, which produced £4773; and the total revenue was £6356, compared with £5906 for the preceding year. The expenditure was £5094; leaving £1262 to go to the profit and loss account, against £1116 at this time last year. The price of coal being higher, and the charge for gas not having been advanced, the Directors were unable to recommend an increased dividend. They, however, advised the payment of 7 and 5 per cent. on the ordinary and preference shares, less income-tax; leaving a balance of £509 to be carried forward. This was agreed to. The working, under the supervision of the Manager (Mr. W. H. Reed) resulted in the sale of 9169 cubic feet of gas per ton of coal carbonized; the coke, tar, and sulphate of ammonia sold being 1324 tons, 27,387 gallons, and 24 tons 11¼ cwt. respectively, or at the rates of 9·6 cwt., 9·9 gallons, and 20·5 lbs. per ton of coal.

Good Management at Bury St. Edmund's.

At the 120th half-yearly meeting of the Bury St. Edmund's Gas Company, the Directors recommended the payment of the usual dividend for the past half year of 10s. per share on the 1849 capital, 7s. 6d. per share on the 1859 capital, and 7s. per share on the 1879 capital, less income-tax. The Chairman (Mr. F. C. Andrews), in moving the adoption of the report, commented on the statement of accounts for the six months ended June 30, showing that the sale of gas brought in £3976, which was £100 in advance of the corresponding period of last year. The output of gas had, indeed, he said, reached as much as it was before the borough lamps ceased to be lighted by gas in 1902. This was considered very satisfactory. The manufacture of gas involved an outlay of £3198; but repairs of works were included in this amount. Further improvements in the way of extensions would, no

doubt, redound to the advantage of the Company, whose reserve fund now reached £3000, which was also very satisfactory. The Chairman referred to other matters which pointed to the progress of the Company and conduced to its general welfare. The Vice-Chairman (Mr. Floyd), in seconding the motion, expressed gratification that the reserve fund had received a substantial increase. The report having been unanimously adopted, the Chairman drew attention to the retirement of Mr. A. Mitchell, as Manager, after close upon thirty years' association with the Company. During his long connection with them, he had endeared himself to all the Directors by his ability, energy, and straightforwardness, having conscientiously discharged his arduous duties for this long period. For the appointment of his successor there were 130 applications; and they believed they had made a good choice in the selection of Mr. A. F. Young. Mr. Mitchell would retain the secretaryship. Mr. Mitchell acknowledged the kind remarks which had been made in appreciation of his services, and went on to speak hopefully of the Company's prospects; gas being, he said, in demand not only for lighting, but also for cooking, heating, motor power, and industrial purposes.

Increased Consumption and Extended Works at Camborne.

The report submitted at the annual meeting of the shareholders of the Camborne Gas Company last Wednesday set forth that during the past year upwards of 200 additional services had been connected and 33 cookers fixed. To meet the growing demand for gas the Directors entered into a contract with Messrs. Willey and Co., Limited, for the erection of an additional holder, which had just been completed (see *ante*, p. 462). New plant for the manufacture of sulphate of ammonia had been erected, and was giving every satisfaction. A mechanical washer had been purchased, and would shortly be erected at the works. In order to provide funds for these extensions, £4000 of additional capital was offered to the public and was considerably over-subscribed. The balance to the credit of the profit and loss account was £538, and the Directors recommended payment of a dividend of 3 per cent. for the half year; making a total of 5½ per cent for the year, which would absorb £360 and leave £178 to be carried forward. In consequence of the death of Mr. W. Bailey, the Manager and Secretary, the Directors secured the services of Mr. S. J. Ingram as Engineer and General Adviser, and appointed Mr. W. J. Crouch and Mr. C. C. Veale, both of whom were already in the service of the Company, as Secretary and Works Manager respectively. Mr. H. P. Vivian, the Chairman, in moving the adoption of the report, congratulated the shareholders on the continued prosperity of the Company, and said the output of gas had increased from 8½ million cubic feet to 23 millions. Under these circumstances, the additions which had been made to the plant were absolutely essential. Mr. Ingram, the Engineer, said the undertaking afforded proof that the gas industry was able to hold its own in spite of keen competition. The new consumers represented the artisan class, and there was room for great development among the small consumers, to whom they were now offering facilities. The erection of a new holder was needed, and would provide them in the coming year with storage equal to 24 hours' maximum consumption. The report was adopted, and the dividend recommended declared.

Depression Checks Increased Consumption at Leatherhead.

At the recent general meeting of the Leatherhead Gas Company, the Directors reported that the receipts in the year ended the 30th of June amounted to £9698, and the expenses to £7260; leaving a balance of £2438. The sum available for distribution was £2788; and the Directors recommended the payment of a further dividend of 2½ per cent., making with the interim dividend 5 per cent. for the year. This would absorb £934, and leave £1854 to be carried forward. The Chairman (Mr. F. Hue Williams), in moving the adoption of the report, said that, notwithstanding the unfair competition of the management of the Electric Lighting Company, they had held their own. They had been handicapped somewhat by dear coal; but, on the whole, he thought the shareholders could not but be satisfied with the balance-sheet they had received. There had been a loss on the sale of coke of £150. The market had been somewhat glutted with coke; a certain amount, they had reason to believe, having been dumped down in the neighbourhood. Out of the extra expenditure, the gasholder and tank just completed cost £3788; and other charges amounted to £962. These additions to the plant would relieve them of anxiety at times of heavy demand; and there were now greater facilities for the regular working of the retorts and other apparatus. They were also erecting, under the superintendence of their Consulting Engineer (Mr. F. S. Cripps), new offices and show-room. During the year the ordinary consumers had taken 445,000 cubic feet more gas, and there were 15 new customers. Through the prepayment system, 216,000 cubic feet more gas had been consumed, and the new consumers numbered 50. A greater increase would undoubtedly have been maintained but for some depression in trade, and a number of empty houses in the district. Mr. W. H. Brown, in seconding the motion, drew special attention to the excellent condition of the works; saying they were now better than they had been at any previous time in the Company's history. The motion having been carried, the retiring Directors and Auditor were re-elected, and the fees of the former were increased. The Chairman proposed a vote of thanks to the Secretary (Mr. J. Young), the Consulting Engineer, and the staff generally, for the efficient fulfilment of their duties; and it was unanimously accorded. The gentlemen named having acknowledged the vote, a similar compliment to the Chairman and Directors brought the proceedings to a close.

Good Profit and a Superannuation Scheme at Maidstone.

At the annual meeting of the Maidstone Gas Company on the 12th inst., the Directors reported a balance of £13,099 in favour of the Company; and they recommended the declaration of a dividend (less income-tax) for the year ended the 30th of June last at the rate of £7 5s. 6d. per cent. per annum, half of which had been paid as an interim dividend in March. The Chairman (Mr. George Marsham), in moving the adoption of the report, said the accounts accompanying it showed the stability of the undertaking, and that steady progress was still being made with the business. Although depression in trade last winter caused a decrease of about ½ per cent. in the gas sold on the year, yet their total profit on gas and residuals worked out at £13,753, compared with £13,342 the previous year; making the largest profit the Company had earned in any year. It was encouraging to find that the six months to the 30th of June compared favourably, as to the sale of gas, with the corresponding period in 1908. Improvements in the gas industry which were so greatly stimulated by the introduction of electric lighting continued to be made. The Company endeavoured to adopt all such improvements, and were now availing themselves of the Botley process to prevent naphthalene stoppages in gas mains and services. The cost of this was about £422; but the sum would probably be saved in the labour of clearing mains and pipes, while the complaints from consumers in regard to insufficient supply would in course of time greatly diminish. Having referred to the decision of the Corporation to further increase the public electric lighting throughout the town, and to the action taken by the Company in the matter, as noticed in the "JOURNAL" for June 29 (p. 988), the Chairman said the Directors, following the lead of the South Metropolitan Gas Company, and some other well-established companies, had inaugurated a superannuation scheme for their workmen, including foremen and slot-meter collectors. It came into operation on the 1st of July. A weekly contribution was made by all permanent employees, and the Company would contribute to the fund a sum which the Directors estimated at about £50 per annum. This would enable them to pay pensions of 5s. a week to workmen, and 10s. to foremen, on their attaining the age of 70 years; and the pension to workmen would not preclude them from enjoying the State old-age pension of 5s. a week. The sick and benefit fund had been working successfully for several years, and the Directors trusted the superannuation fund would work equally well, and prove very beneficial to the workmen, as well as being a further bond of union between employers and employed. In conclusion, the Chairman said the Board deeply regretted the loss by death of their colleague Mr. William Bryant, who had filled the offices of Auditor and Director for 33 years; and they had also lost another valued old friend in Sir George Livesey, by whose friendly and most valuable advice they had benefited on many occasions. The Deputy-Chairman (Dr. C. E. Hoar) seconded the motion; and it was carried unanimously. The dividend recommended was then ordered to be paid.

A Twelve per Cent. Dividend at Malton.

Notwithstanding the keen opposition of electricity for both lighting and motive power, the Malton Gas Company continue their progressive and successful career; and at the recent half-yearly meeting, the Chairman (Mr. Hugh W. Pearson) had the pleasure of moving the payment of a dividend of 6 per cent. for the six months ended June 30—this being the same amount as in the two immediately preceding half years. The Chairman submitted the report and accounts; the former opening with a reference to the satisfaction of the Directors at the maintenance of their business position. Owing to the depressed state of the market for residuals, it was stated that the income from this source had been less than in the corresponding half of last year. The sum applicable for dividend was £3456, out of which it was proposed to pay the usual dividend, free of income-tax, and carry forward £2016. It was mentioned that the Company had been successful in securing the contract for lighting the streets of Norton for the next three years; Malton being now lighted by electricity. They had also made a satisfactory contract for the supply of coals for the current year. In moving the adoption of the report, the Chairman said one feature to which he might allude had reference to their negotiations with the Assessment Committee of the Malton Board of Guardians. The Company had asked the Committee for a reduction in the amount of the assessment of their works and plant; and it appeared that the Committee had decided to engage an expert to go into the whole question. He thought the Company had good grounds for making a demand for a reduction. They had lost the lighting of Malton, in connection with which, of course, they previously had property liable to assessment; and they had kept up their dividends by rigid economy, and by the development of their business in the direction of the use of penny-in-the-slot meters and in other ways. The income from these was not rateable, and therefore the Company's request for a reduction of their assessment was a perfectly fair and legitimate one. Mr. Thurley Rose seconded the proposition; and it was unanimously carried. The dividend was then declared; and the usual votes of thanks to the Directors and officers brought the meeting to a close.

Increased Sales at Peterborough.

In moving the adoption of the report at the half-yearly meeting of the Peterborough Gas Company, Alderman D. H. Redhead, the new Chairman, deplored the loss of his predecessor, Mr. William Harris, to whom, he said, so large an amount of the prosperity of the Company was due. Turning to the working, the Chairman remarked that during the last twelve months they had sold between 6 and 7 million cubic feet more gas—a considerable increase, despite the competition of the electric light. They were putting down two benches of retorts to make gas of a better quality and with less waste. Their turnover was £33,000 a year; and they paid rates to the amount of £1680 annually. The only regret he had to express to the shareholders was the loss of their assessment appeal at Quarter Sessions. They felt very keenly having to pay £300 a year more in rates. He proposed the adoption of the report and accounts, and the payment of maximum dividends. Alderman Miller seconded the motion; and it was carried.

Economical Management and Reduced Price at Salisbury.

In moving the adoption of the report at the annual meeting of the Salisbury Gas Company last Wednesday, the Chairman (Mr. George Fullford) said the work of the Company during the past year had been satisfactory, and he could again congratulate the shareholders on the position of the business. Gas of a high degree of purity had been supplied; the illuminating power having averaged 17½ standard candles. The working plant had been maintained in sound condition and repair, some necessary additions had been made thereto, and new mains had been laid where required. The system of maintaining burners and mantles, both for inside and outside illumination, at a low fixed charge, was much appreciated by the consumers; and there was a steady demand for cookers, heating-stoves, and gas for power purposes. Coke had sold at lower prices than in 1908. The tar market continued

in the low state which had prevailed for some years past; but there was some improvement as regarded sulphate of ammonia. Chiefly owing to a reduction in the cost of coal on the contracts for the year just commenced, but also to some appreciable extent to the skill and economical management of their Engineer (Mr. Norton H. Humphrys), they were able to announce another reduction in the price of gas. On Oct. 1, 1908, it was reduced to 3s.; and this year they had decided to lower it to 2s. 11d. as from the 1st of October. The reduction could not apply to the public lighting, which stood on quite a different arrangement from consumption by meter. They took it at a fixed price per lamp, which covered much besides the gas consumed—such as lanterns, burners, supply-pipes, cleaning, painting, keeping in order, lighting, and extinguishing. A very large proportion of the price received went for labour and material; and while the cost for gas had been reduced, the other charges had increased. The extension of the borough, and the lighting of the courts in the city, had largely added to the mileage to be covered by the workmen as compared with the number of lamps; and any benefit arising from a lower cost for gas had been more than neutralized by the increased cost of labour and material. Mr. W. Young seconded the motion; and it was carried unanimously. The usual dividends having been declared, and the retiring Directors and Auditor re-elected, a vote of thanks was accorded to the Chairman, Directors, and staff for their services during the year. The compliment was acknowledged by Mr. S. R. Atkins on behalf of the Board, and by Mr. Humphrys on the part of the staff.

Another Year of Progress at Taunton.

At the annual general meeting of the Taunton Gas Company held last Tuesday, under the presidency of Mr. Jonathan Barrett, the Directors reported that the quantity of gas sent out in the twelve months ending the 30th of June was 105,792,000 cubic feet; and that the amount of profit available for distribution was £7580. Out of this, they recommended the declaration of dividends at the rates of 5 and 8 per cent. on the preference and consolidated "A" stock, and of 7 per cent. on the new ordinary stock and the yellow shares. These dividends would absorb £3720. The Directors further recommended that the additional dividends of 1 per cent. and ⅞ per cent. respectively payable under the sliding-scale, amounting to £454, should be transferred to the reserve fund account. The Chairman, in moving the adoption of the report, expressed his pleasure at announcing that the undertaking was continuing in the prosperous career it had had for so many years past; and he hoped and believed it would still go on doing so. The quantity of gas sent out during the past year showed an increase of 2,376,000 cubic feet on the previous twelve months. They had been continually increasing their output for years past; and with the completion of the extension of the works by the erection of the new holder and purifier, they would be able to meet all the demands which might be made upon them during the next ten or twelve years. The Deputy-Chairman (Mr. W. H. Fisher) seconded the motion; and it was carried. The dividends having been declared, and the amount proposed transferred to the reserve fund, a vote of thanks was accorded to the Chairman and Directors. Mr. Fisher, in proposing a similar vote to the Secretary and Manager (Mr. A. J. Edwards) and the staff, said that in Mr. Edwards they had a most energetic man, who looked well after the interests of the Company, and who also had a great knowledge of all matters connected with gas making. The staff also efficiently carried out their duties, which had considerably grown of late years, owing to the increase in the number of penny-in-the-slot meters in use. Mr. R. Bruford seconded the motion. The Chairman, in supporting it, said a better Manager than Mr. Edwards he did not think it was possible to have. The vote having been heartily accorded, Mr. Edwards, returning thanks, said he was able to state that the customers of the Company were better satisfied now than ever he had known them to be. At the present time the Company had 2200 prepayment customers in Taunton; and in a very few years, if they continued to increase at the present rate, these customers would equal, if they did not exceed, the others. They had brought their business to such a state of excellence that he did not think there were more than five or six other gas companies in the kingdom, whose results were published, who were doing as well as, or better than, their own Company in this respect. He was very proud of this fact; and he thought the shareholders would be pleased to know that their business was now on a very much broader basis than it used to be. He hoped it would continue.

Small Increase in Sale at Tunbridge Wells.

At the recent half-yearly meeting of the Tunbridge Wells Gas Company, the Chairman (Mr. W. H. Delves), in making the usual interim statement, said there had been a small increase in the sale of gas in the past six months, compared with the very large increase the preceding year. This was their usual experience after an exceptional increase; and looking at the reports of other large companies, it would be seen that they had all been adversely affected by the mild winter up to March. Their increase was 1½ per cent., against 7½ per cent. last year. They had a new contract for coal at a decrease of 1s. 4d. per ton; but the benefit of the new contract would not be felt until the current half year. The same remark applied to the new contract for oil, which was rather more than a ½d. per gallon less. The sale of residuals, as was the general experience of all companies last winter, was not satisfactory, especially in coke. Though they had sold more, the net result was £700 less. The general result was that, deducting the residuals, the cost of carbonizing was nearly 1d. more per 1000 cubic feet of gas sold. He hoped that, with the new contracts, this increase in cost would remedy itself. There was also a decrease in the revenue from public lighting, as the Corporation, in their wisdom, were altering 200 street gas-lamps to electricity at a higher charge than the Gas Company were prepared to tender. As the public lighting only represented 2½ per cent. of the Company's revenue, this was of very small concern to the shareholders; and the cost of public lighting was now of far greater importance to the ratepayers, who paid the bill, than to the Company, who could afford, except in their capacity as large ratepayers, to look with indifference at the action of the Corporation towards them. The gas-rentals showed an increase in every department, except in street lighting and supplies outside the borough. The latter was difficult to account for. In regard to the co-partnership scheme, it had not been in operation long enough for the Directors to offer any judgment upon its working; but they had every confidence that it would prove a success, and that it was a step in the right direction to make their employees sharers in the benefits of the economical working and the growth of the Company's business. He believed the shareholders would be able to look forward with every confidence to the completed balance-sheet for the year. The usual interim dividends were declared; and a vote of thanks was passed to the Chairman.

Increased Carry-Forward at Wakefield.

The 125th half-yearly meeting of the Wakefield Gas Company was held on Monday last week. In moving the adoption of the report, the Chairman (Dr. W. A. Statter, J.P.) alluded to the loss the Directors had sustained in the deaths of the Secretary (Mr. W. H. Parker) and the Assistant-Manager (Mr. Frank Saville). Mr. Parker had been with the Company 32 years, for 18 of which he had held the position of Secretary; he had filled the position with credit to himself and to the complete satisfaction of the Board. Mr. Saville was also a valued officer, and his early death was deplored by the Directors. The Chairman then announced that they had elected as Secretary Mr. R. B. Wilson, who had been in the Company's service for 15 years, and in whom Mr. Parker and the Board had the utmost confidence, and who had during Mr. Parker's long illness carried on the work to their entire satisfaction. The shareholders unanimously approved the appointment. Dr. Statter then went through the various items in the balance-sheet, which he said was very satisfactory. They had earned their usual dividends, and carried forward £119 more than the amount with which they started the half year, in spite of bad trade and dear coal. A hearty vote of thanks was passed to the Chairman and Directors, in acknowledging which the Chairman moved a cordial vote of thanks to the officers and staff. This was unanimously carried, and responded to by the Engineer and Manager (Mr. H. Townsend) and the Secretary.

COAL MINES BILL.

The text has been issued of the Home Secretary's Bill to amend the Coal Mines Regulation Act of last year. It contains only two clauses, which are in the following terms.

1. Sub-section (1) of section 1 of the Coal Mines Regulation Act, 1908 (which prohibits a workman being below ground in a mine for the purpose of his work, and of going to or from his work, for more than eight hours during any consecutive twenty-four hours), shall be construed as if for the words "during any consecutive twenty-four hours" there were substituted the words "during any period of twenty-four hours, reckoned from midnight to midnight:"

Provided that:

(*a*) In the case of a workman whose period of being below ground commences at or before midnight and terminates after midnight, the period of twenty-four hours shall be reckoned from midday to midday; and

(*b*) An interval of at least eight hours shall elapse between the termination of one period of being below ground and the commencement of the next.

Sub-section (6) of section 1 of the Coal Mines Regulation Act, 1908, is hereby repealed.

2. This Act may be cited as the Coal Mines Regulation Act, 1909, and shall be construed as one with the Coal Mines Regulation Acts, 1887 to 1908, and this Act and those Acts may be cited together as the Coal Mines Regulation Acts, 1887 to 1909.

Reductions in the Price of Gas.

The Directors of the South Hams Gas Company have decided to reduce the price of gas from 3s. 11d. to 3s. 8d. per 1000 cubic feet from the 1st of October. The Cambridge Gas Company have reduced their price from 2s. 9d. to 2s. 8d. per 1000 cubic feet. At Grantham the price has been reduced from 3s. 2d. to 2s. 11d. The Gas Committee of the Warrington Corporation have resolved to reduce the price of gas 1d. per 1000 cubic feet throughout the area of supply as from the 1st of November next. The slot-meter consumers within the borough will have an additional 5 cubic feet of gas for 1d., and those outside a proportionate quantity. The Directors of the Alfreton Gas Company have decided to reduce the price of gas by 2d. per 1000 cubic feet, making it 3s. 10d., from the 1st of January next. The Montrose Gas Company have reduced the price of gas 2d. per 1000 cubic feet for all purposes, as from the date of the last meter inspection. The Rossendale Union Gas Company have reduced to 3s. 2d. per 1000 cubic feet the price charged to consumers of less than 500,000 cubic feet per quarter. With the view of encouraging cottagers to consume gas in the Sedgley, Lower Gornal, and Upper Gornal Districts, the Sedgley Urban District Council have decided to provide prepayment meters, cooking-stoves, and two lights in a house without any charge for rent of fittings, and also to reduce the price of gas from 3s. 6d. to 3s. 3d. per 1000 cubic feet. The Clitheroe Town Council have decided to reduce the price of gas from 3s. 2d. to 2s. 10d. after the 25th of March next. The Directors of the Salisbury Gas Company have reduced their price from 3s. to 2s. 11d. per 1000 cubic feet as from the 1st of October. As from the 30th prox., the price of gas at Wicklow will be reduced from 5s. 3d. to 4s. 11d. for lighting, from 4s. 9d. to 4s. 7d. for cooking, and from 4s. 4d. to 4s. 3d. for power purposes.

Accident at the Schoneberg Gas-Works, Berlin.—During a windstorm shortly after midday last Thursday, an iron tower 250 feet high, supporting a crane used in the construction of the gasholder now being built at the Schöneberg works of the Imperial Continental Gas Association, fell just as a train was passing over the adjacent railway line. Fortunately the train was almost empty; but one carriage was smashed by the wreckage, and five people were injured.

A CALORIFIC TEST FOR COAL GAS.

The following letter by Mr. G. M. Gill, of Blackheath, dealing with the subject of the calorific test for coal gas, appeared in the Engineering Supplement to "The Times" last Wednesday.

The calorific power test accepted by the Gaslight and Coke Company in their Bill, which formed the subject of an article by Professor Frank Clowes in "The Times" Engineering Supplement for July 28, has been, as might be expected, the subject of general discussion in gas engineering circles for some months past. While there is no objection to a heating standard taking the place of the now obsolete illuminating power standard, there is a grave objection to the introduction of an additional standard.

It is strongly felt now that the days of monopolies in lighting are past and over, and in times when there is severe competition on the part of electrical undertakings, that freedom from all restrictions and standards is most required to enable gas companies to give the consumer the service he requires, and which he is at liberty to reject in favour of electricity. There would not be so great an objection to standards and penalties on the part of gas supply companies were electrical undertakings placed in a similar position; but in the case of the latter there is freedom to supply their commodity as may best suit themselves and their consumers. It is, it must be admitted, unjust that of two traders, each appealing for the custom of the public, one should be hemmed in with restrictions while the other is given a free hand. It is reasonable to suppose that the suppliers of gas and electricity are best qualified to judge the most suitable form in which to supply their commodity; and, further, it must be remembered that on their judgment depends the support of the public. This is in itself quite sufficient to ensure a proper service.

However, as long as there are tests with which compliance must be made, gas companies will endeavour to advise Parliament by introducing into their Bills whatever alterations they deem necessary in the interests of the public. At the present time there is a strong feeling among gas engineers that the illuminating power standard should be abolished in favour of a calorific power standard. Were this carried out, it is quite certain that gas companies would give the remaining consumers still using the extravagant and quite obsolete flat-flame burner, facilities to replace them with a suitable burner of the incandescent type. It is said that in many Continental towns it is impossible to find a flat-flame burner; for the reason that in these towns gas is so much more expensive than it is in English towns, owing to the cost of raw material, that it is necessary, for economic reasons, to burn the gas in the most advantageous way.

In Berlin, which is often quoted as being the most brilliantly lighted city in the world, it is the custom to supply a gas of about 11-candle power, compared with from 14 to 17 candles in London. It is a change of this kind which English gas engineers recognize as being desirable at the present time. It should perhaps be pointed out that the lower candle power gas supplied in Berlin with an incandescent burner gives as much light as the higher candle gas supplied in English towns; and as the higher candle gas costs considerably more to manufacture, it will be seen that a great deal of money is in this country unnecessarily wasted.

There is one other point which should be raised, and it is that under the sliding-scale clauses it is obligatory for gas companies to reduce the price of gas to consumers before increasing the dividend to shareholders; and it depends on the amount of the reduction as to how much may be added to the dividend. In every reduction of the price of gas under the sliding-scale, it is so arranged that fully 80 per cent. or 90 per cent. of the saving goes to the consumer; the balance being credited to the shareholder. In this way, the interests of the public are most excellently safeguarded.

As Professor Clowes points out, the introduction of the calorific power test marks an era, and it is undoubtedly true that the example of the Gaslight and Coke Company will be followed in the acceptance by gas authorities generally of a calorific test, though not in addition to an illuminating power test.

The introduction of a test for standardizing the value of gas as a generator of heat will be a most excellent means of educating the public to appreciate properly the advantages and economies of superseding coal, with its attendant production of smoke and dirt, by gas for cooking and heating.

Professor Clowes's remarks as to the necessity of valuing coal more scientifically are indeed to the point, and should be more generally recognized and carried out by the consumers of our national coal supplies.

SULPHATE OF AMMONIA INDUSTRY IN GERMANY.

French manufacturers of sulphate of ammonia only supply a portion of the national consumption; the remainder being imported from England and Germany. It is consequently of interest to follow the progress of the industry in these places. The following are some details extracted by the "Revue des Produits Chimiques" from the annual report of the German Sulphate of Ammonia Association of Bochum.

A very brisk demand, especially in the English market, manifested itself at the commencement of 1908; but business was unfavourably influenced by the fall in Japanese orders and the difficulty experienced by the Japanese in meeting their engagements. A stoppage in the retrograde movement of prices in the English market occurred at the end of December, when the complete removal of stocks, owing to large shipments, demonstrated that the pessimistic views entertained during the year were ill-founded. This improvement is to be ascribed to the action of the Association, who withdrew entirely from the export market in the middle of the year, and thus allowed Great Britain to sell small quantities on the German coast with profit. Acting in this way, the Association considered that compensation for a fall in exports could only be obtained gradually, but that keen competition with Great Britain at a time when there could not be an increase in consumption would only result in destroying all firmness in the situation of the market, without any profit. This view was correct, because during the first months of the year business looked promising; shipments being 128,401 metric tons in the seven months ending in July, against 92,505 tons in the corresponding period of 1907. During the remaining five months, however, there were only 44,049 tons, against 63,138 tons in the preceding year. The quantity supplied by the Association in 1908 was 172,450 metric tons, to which must be added 5000 tons supplied by the Comptoir du Sulfate d'Ammoniaque of Brussels. Thus the total on account of the Association was 177,450 tons in 1908, against 155,643 tons in 1907. In addition, 9076 tons of concentrated ammoniacal liquor were shipped last year, against 13 286 tons in 1907; so that there is an increase of about 20,000 tons compared with 1907.

It is stated in the report that sulphate of ammonia is always cheaper now than Chili nitrates; and this is why German agriculturists find it to their advantage to give it preference. It has been clearly demonstrated that sulphate of ammonia is as rich in nitrogen as the nitrates. It is to be noted that in 1908 Germany took the lead with a consumption of 284,000 tons of sulphate of ammonia. Great Britain figures for only 79,000 tons; France for 87,000 tons; and Belgium and Holland for 67,000 tons. During the last decade, the German consumption of sulphate increased from 123,000 to 284,000 tons; while that of nitrates only rose from 325,000 to 400,000 tons in the same period. As the sulphate contains one-third more nitrogen than nitrate, it may be said that Germany consumes about as much nitrogen in sulphate as in nitrate. German imports of sulphate last year were 47,265 tons, against 38,522 tons in 1907; Great Britain supplying 24,913 tons and Austria-Hungary 17,928 tons in this total.

SALE VALUE OF CORPORATION UNDERTAKINGS.

Borough Treasurer of Nelson and Municipal Trading.

In presenting his annual report and abstract of accounts, the Borough Treasurer of Nelson (Mr. C. H. Brear) has something to say about municipal trading. He shows that the total assets of the Corporation exceed the liabilities by £255,987; and he points out that if the profits of the municipal trading concerns were capitalized at 3½ per cent., they would be sufficient to pay off not only the total loan debt but the whole of the outstanding liabilities of the Corporation. It must not, he adds, be supposed that these capitalized profits are intended to represent the true sale value of the various undertakings, but rather to indicate the extent to which the Corporation have been justified, from a financial standpoint, in carrying on the works. Mr. Brear proceeds: "Much outcry has been raised from time to time against the growing debt of municipalities as the result of municipal trading. This statement is designed to show, on the one hand, what the debt on the undertakings is, and, on the other, the working value to the town of the works and properties represented by the outlay. The most logical method of arriving at this value is suggested to me by the fact that upon the amount which it has been necessary to borrow the town has to pay interest at the rate of 3½ per cent. It is clear, therefore, that any capital investment which, after making proper provision for depreciation, has yielded a profit of 3½ per cent., has earned a sum sufficient to enable the concern to pay its way. If, however, greater profits than 3½ per cent. are made, a greater amount of capital must necessarily be taken, in order to bring the percentage of profit to the 3½ per cent. level, and the amounts shown as capitalized trade profits are therefore the amounts which, if sunk, would realize profits of exactly 3½ per cent. For instance, Nelson's gas undertaking, with a capital outlay of £200,199, yielded a trade profit of £15,175, or 7·58 per cent.; whereas 3½ per cent. on this capital would amount to only £7004, and consequently the amount of capital for which £15,175 would be 3½ per cent. is £433,571. The sale value of municipal undertakings cannot, of course, be gauged by the profits actually made. A corporation does not exist for the purpose of making profits out of its undertakings, but rather to use those undertakings to the general advantage of the ratepayers. Charges for the products or commodities are often cut down as low as the cost of production will allow, and the profits are necessarily much smaller than they would be by a company working solely for the benefit of shareholders."

ELECTRICITY DISASTER IN AN ITALIAN VILLAGE.

News reached London last Thursday of a terrible electricity accident which occurred in the village of Olginate, near Lecco, on the south-east arm of the Lake of Como, on the previous day, whereby twelve people were killed and about thirty sustained injuries. The following particulars of the catastrophe were given in the "Daily Telegraph" on Friday by the Milan Correspondent of that paper.

Olginate is situated on the left bank of the Adda River, a few miles south of Lecco. Electric light is cheap in the district, which is very rich in hydraulic power, and in every house even the stables are lighted by electric lamps. Last night [Wednesday], while a furious thunderstorm was raging over the Lake of Como and the bordering country, some wires conveying high-tension current from the power-house near Olginate were broken and fell, coming into contact with the electric light wires. A short-circuit was instantly produced in every house, and sparks and blue flames appeared. Instinctively somebody in every house switched off the light for the purpose of preventing the danger of fire. The result of this inconsiderate move was disastrous, for twelve people were killed outright, and twenty-nine received severe shocks and burns. The wires caught fire and fell from the walls, catching in their coils the terrified men and women. In some houses the walls and floors became charged with electricity to such a degree that the inhabitants could not touch them without getting shocks, and in many

ases they were forced to rush or jump out. In the meantime, every-vhere in the village the lights were extinguished. The darkness in-reased the terror of the people, who began to flee through the gloomy treets under a pouring rain, madly screaming whenever flashes of ightning illumined the sky. At last the current was cut off, firemen nd soldiers arrived from Lecco, and quiet was restored to the village. The victims belong almost exclusively to the lower classes of the popu-ation; and it seems that in their houses the electric fittings were on ld systems, and not in good order. As a matter of fact, in the villas vhere the fittings were up to date, the short-circuit had no serious esults, or only very slight ones.

USE OF TAR FOR DUST PREVENTION ON ROADS.

Opinions of Engineers and Surveyors.

Some time ago, a Committee was appointed by the Councils of the Aetropolitan Boroughs, at the suggestion of a conference of delegates rom local authorities held in Westminster early in 1903, for the pur-ose of considering the general question of materials and means of aving the streets of London. The Committee recently addressed a ircular to the Engineers and Surveyors of the Metropolitan and neigh-ouring authorities, asking them to give the Committee the benefit of heir experience as to the desirability or otherwise of tar-spraying nacadamized or gravel roads, and the advantages and disadvantages enerally of the system. The following are the replies received from hose who have treated the roads in their district with dust-preventing naterials.

Battersea.—The Borough Surveyor (Mr. T. W. A. Hayward) states hat in his opinion it is desirable to treat roads with tar for the purpose f laying dust, &c. He considers it desirable to apply the tar by neans of hand-painting, as by this method it is more evenly dis-ributed over the roadways, and better results accrue. The cost of ar-painting in his borough has averaged ⅝d. per yard. This does not nclude sanding after painting, but includes the cleansing of the road-vay before this operation. Tar-painting is, in his opinion, most ad-antageous for laying dust; and ordinary macadamized roads are more asily kept clean after they have been treated with tar.

Croydon.—The Borough Road Surveyor (Mr. E. F. Morgan) states hat his experience is that by properly treating gravel, flint, or granite nacadam roads with tar, many advantages are obtained. The road urface is very much preserved, disintegration being prevented, and he dust nuisance is thereby greatly reduced. The noise caused by ehicular traffic is minimized; and after rain the road quickly assumes dry surface. From personal observation, he is of opinion that while orse-drawn vehicles and cycles require less effort when travelling pon a tarred surface, heavily-laden motor waggons and steam traction-ngines require more traction effort than upon ordinary macadam, more especially when the tarred road surface is wet. Various so-called dust preventives have been tried in the borough; but the only satisfactory method has been the treatment with tar. After experience with a tar-spray machine, Mr. Morgan finds the best and most lasting results are obtained by hand labour—*i.e.*, a horse-drawn vehicle to convey the tar, and men with squeegees, with which the boiling tar is rubbed thoroughly into the surface. This is afterwards coated with coarse granite chippings, and in busy thoroughfares this is quickly faced-up by the passing traffic. In residential streets, a light petrol-driven roller is used for the purpose. The cost of the treatment described works out at about 1·31d. per superficial yard.

East Ham.—The Borough Engineer (Mr. A. H. Campbell) has treated flint roads, gravel roads, and granite macadam roads with tar; and he finds that those which have given the best results are gravel roads, bound together by tar as a consolidating agent or medium, when the road itself was in course of construction. He has also sprayed tar upon flinted roads already consolidated by time and traffic; but as yet he is unable to form an opinion as to its desirability and efficiency. The best dust-preventing material he has yet used upon macadamized or gravel roads is refined tar, at 3d. per gallon, delivered upon the work; each gallon covering 7 to 8 yards. He has applied the tar by hand, well brushed on to the surface of the road, also by a force-pump direct from the tar-boiler, and likewise by the hand-spray, which, in his opinion, though not so fast, is very facile and economical. Tar itself will work out at about ⅜d. per superficial yard, labour at about ⅜d., and sanding at less than ¼d.—say, in all, 1⅛d. per yard. He does not consider a tar-sprayed road suitable to sustain the weight and the momentum, with its consequent suctional action upon the road surface, of vehicles mechanically propelled; but he considers it quite suitable for those which are horse-drawn vehicles.

Fulham.—The Borough Engineer and Surveyor (Mr. Francis Wood) considers it desirable that all macadam roads should be tar-sprayed. He has obtained the sanction of his Council to treat the whole of the macadam roads in his borough, and about one-third have already been done. The roads are sprayed by hand, and the cost works out to practically ½d. per superficial yard. He considers that only roads which have not been recently made-up should be sprayed with tar; and he finds it is practically useless to treat flint and gravel roads where there is much traffic. The saving in scavenging is very considerable.

Greenwich.—The Borough Engineer and Surveyor (Mr. E. J. Heward) has not tried tar-spraying, but has treated some roads on Blackheath with tar, put on boiling hot by hand, brushed into the road, and then covered with sand. This work has been too recently done to enable him to say whether or not the method is altogether satisfactory.

Kingston-upon-Thames.—The Borough Surveyor (Mr. R. Hampton Clucas) states that the main streets of Kingston—the shopping district—are treated with Akonia, which he says is very easily applied, and gives good results. If this area were tarred, he thinks the shopkeepers would find tar carried into their shops, and complaints would soon be lodged. The main Portsmouth road is treated with Hahnite; and Mr. Clucas finds that a coating put on once every five weeks is sufficient to keep down the dust. The cost is 0·9d. per square yard. Many roads

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 503.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17¾—18¼	..	5 9 7
298,955	10	,,	7	Do. 7 p.c.	12½—13	..	5 7 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd.. . . .	5⅝—5⅞	..	5 10 8
40,000	5	,,	6½	Do. New, £4 paid .	4⅜—4⅝	..	5 12 5
50,000	10	Feb. 25	15†	Bourne- } 10 p.c. . .	28¾—29¼	..	5 2 6
311,810	10	,,	7	mouth Gas } B 7 p.c. .	16¾—17¼	..	4 1 2
75,000	10	,,	6	and Water } Pref. 6 p.c.	15⅝—15⅞	..	3 15 7
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	250—253*	..	4 18 10
300,000	,,	,,	9½	Do. New . . .	190—192*	..	4 19 0
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122*	..	4 2 0
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	100—102	..	3 18 5
220,000	Stk	Mar. 12	11†	Brighton & Hove Orig.	213—215	..	5 2 4
246,320	,,	,,	8†	Do. A Ord. Stk. .	154—156	..	5 2 7
460,000	20	Apl. 16	10	British	43—43½	..	4 11 11
109,000	Stk.	Feb. 25	6	Bromley, A 5 p.c. . .	119—121	..	4 19 2
165,700	,,	,,	4½	Do. B 3½ p.c. . .	89—91	..	4 18 11
82,278	,,	,,	5½	Do. C 5 p.c. . .	108—110	..	5 0 0
5?,000	,,	June 25	3½	Do. 3½ p.c. Deb. .	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13½—14	..	5 0 0
250,000	Stk.	June 25	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord. . .	106½—108½*	..	4 12 2
1,493,280	Stk.	Mar. 12	$5\frac{2}{10}$	Commercial 4 p.c. Stk. .	109—111	..	4 13 8
560,000	,,	,,	5	Do. 3½ p.c. do. .	105—107	..	4 13 5
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	95—97	—1	5 3 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
492,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord. .	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd. . . .	24½—25	+¼	4 16 0
354,060	10	,,	12	Do. £7 10s. paid.	18½—19	+¼	4 14 9
5,141,545	Stk.	Aug. 12	4⅔	Gas } 4 p.c. Ord. . .	104—105*	..	4 8 10
2,600,000	,,	,,	3½	light } 3½ p.c. max. . .	87—89*	..	3 18 8
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	103—105*	..	3 16 2
4,193,975	,,	June 11	3	Coke } 3 p.c. Con. Deb.	85½—86½	..	3 9 4
258,740	Stk.	Mar. 12	4¾	Hastings & St. L. 3½ p.c.	93—95	..	5 0 0
82,500	,,	,,	6¼	Do. do. 5 p.c	118—120	..	5 4 2
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17¾—18¼	..	6 0 7
123,570	Stk.	Mar. 12	6½	Ilford A and C . . .	141—143	..	4 10 11
65,780	,,	,,	5	Do. B	106—108	..	4 12 7
63,000	,,	June 25	4	Do. 4 p.c. Deb. . .	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental .	179—181	..	4 8 5
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95—97*	+1	3 12 11

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c. .	120—122	..	4 18 4
561,000	Stk.	Feb. 25	10	Liverpool United A. .	228—230	..	4 6 10
718,100	,,	,,	7	Do. B . .	168—170	..	4 2 4
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean.	4⅞—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met of } 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 27	3½	Monte Video, Ltd. .	12½—13	..	5 7 8
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesb'd Con.	106½—107½	..	4 3 9
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	92—93	+½	3 12 2
15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½—20	..	5 0 0
55,940	10	,,	7	Do. 7 p c	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	139—141	+2	5 13 6
60,000	5	Mar. 31	8	Ottoman, Ltd. . . .	6⅛—6⅜	..	6 5 6
3?,800	53	Feb. 25	13	Portsea Island A. . .	140—142	..	4 16 11
60,000	50	,,	13	Do. B. . .	132—134	..	4 17 0
100,000	50	,,	12	Do. C. . .	123—125	..	4 16 0
114,800	50	,,	10	Do. D and E.	103—105	..	4 15 3
398,490	5	May 13	7	Primitiva Ord. . . .	6⅝—7⅛	—⅛	4 18 4
796,080	5	July 29	5	Do. 5 p.c Pref. .	5¼—5½	..	4 10 10
488,900	100	June 1	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
1,000,000	10	Apl 29	8	River Plate Ord. . .	16¾—17¼	..	4 12 9
312,650	Stk	June 25	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	14—14½	..	5 10 4
62,500	10	,,	6	Do. 6 p.c. Pref. .	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49½—50½	..	4 19 0
135,000	Stk	Mar. 12	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	233—235	..	4 5 1
523,500	,,	,,	10	Do. C	232—234	—1	4 5 5
70,000	10	June 11	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Aug. 12	5⅓	South Met., 4 p.c. Ord.	119—121*	..	4 8 1
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	84½—85½	..	3 10 2
209,820	Stk.	Mar. 12	8	South Shields Con. Stk.	153—155	..	5 3 3
605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	118—120*	..	4 11 8
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122*	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord. . .	110—112	..	4 9 3
120,000	Stk.	Aug. 12	6⅞	Tottenham } A 5 p.c. .	130—132*	..	5 4 2
453,940	,,	,,	5⅜	and } B 3½ p.c. .	109—111*	..	4 16 7
149,470	,,	June 25	4	Edmonton } 4 p.c. Deb.	100—102	..	3 18 5
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109—111*	+½	4 10 1
255,636	Stk.	Feb. 25	6⅝†	Wands- } B 3½ p.c. . .	140—142	..	4 13 4
79,416	,,	June 25	3	worth } 3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	,,	Aug. 12	5⅜	West Ham 5 p.c. Ord. .	124—126*	..	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref. . .	127—129*	+1	3 17 6
253,300	,,	June 25	4	Do. 4 p.c. Deb. Stk..	112—114	+2	3 10 2

Prices marked * are "Ex div," † Next dividend will be at this rate.

have been tarred by hand at a cost of 1½d. per square yard, and a number tarred with a horse-drawn machine at a cost of ½d. per square yard; these prices including brushing the roads, spreading the tar, and sanding. The advantages of tarred roads are, in Mr. Clucas's opinion, less scavenging, little watering required, the dust considerably reduced, and the life of the street increased by 50 per cent. He uses oil of tar for all flint roads and outside roads, and the results are very satisfactory. No watering is required; there is no dust; and the cost is less than watering—it being only 0·21d. per square yard. He finds tar on flint roads not satisfactory, owing to the fact that in wet weather the metal picks up. He much prefers refined tar for dressing, as the results can be relied upon; but in crude tar they are doubtful.

Lewisham.—The Borough Engineer and Surveyor (Mr. E. van Putten) has treated granite macadam roads by tar-spraying. The cost of this, including tar and labour but not sanding, was ¾d. per yard super. He estimates the cost of sanding at about ½d. per yard.

Middlesex.—The County Engineer and Surveyor (Mr. H. T. Wakelam) says he is this year tar-painting the whole of the county main roads under his direct control; the work being carried out with horsed spraying-machines. Distilled tar, Clare's composition, and "Tarvia" are used, and the cost allowed for the work if carried out by hand labour is 1¾d. per yard; if by horse machine, 1d. per yard; and if by mechanical spreaders, ¾d. per yard.

St. Pancras.—The Borough Engineer and Surveyor (Mr. W. N. Blair) states that they have only made one experiment in tar-spraying a macadamized road, and it was not a success, probably on account of the weight of traffic using the road. It was noticeable that a large amount of black oily mud was produced for some time after the application of the tar; and Mr. Blair is by no means encouraged to repeat the process in a street subject to heavy traffic.

Wandsworth.—The Borough Engineer and Surveyor (Mr. P. Dodd) states that during the summer of 1908 a length of about 14½ miles of road was tar-sprayed with beneficial results at a cost of 1d. per superficial yard. The tar was applied under pressure by a machine. Watering has been unnecessary in most of the tar-sprayed roads; while in others, subject to motor and omnibus traffic, a little sprinkling on the sides, or occasional washing only, has been sufficient. A considerable saving has been effected in street watering; and the cost of cleansing and maintaining the roads has been materially reduced. Tar-spraying is not suited to roads with steep gradients; but on other granite macadam roads it is equally suitable for horse-drawn and for mechanically-propelled vehicles. The only disadvantage is the temporary inconvenience to the public while the roads are being sprayed. The total length of roads repairable by the borough is approximately 185 miles, of which 17 miles have already been tar-sprayed; and during the current year a further 40 miles will be treated in this manner. The work is carried out under contract, and the present cost is 1d. per superficial yard for one coat, less 2½ per cent.

Westminster.—The City Engineer and Surveyor (Mr. J. W. Bradley) is of opinion that tar spraying and painting is a satisfactory method of treating macadamized roads. He finds the cost to average about ¾d. per yard super.

Wimbledon.—The Borough Engineer and Surveyor (Mr. C. H. Cooper) states that last year they had a length of about a mile of macadamized carriageway done with Clare's composition, and about one-third of a mile with "Tarvia." This year they are having about six miles of carriageway treated partly with distilled tar and partly with gas tar. The method adopted has been to have the dressing spread by one of the "Taroad" distributors. Mr. Cooper considers the dressing is equally suitable for horse-drawn and mechanically-propelled vehicles. Last year the roads treated were subjected to motor-omnibus traffic. The costs this year per superficial yard are 1 9-40d. for distilled tar, and 1 7-20d. for "Tarvia." The advantages of treating roads with such dressings are that they prevent dust arising from the road material, and thereby effect considerable economy in maintenance. The great disadvantage of tar is that persons will walk on roads newly tarred, and carry the tar into houses and shops; and there are always a certain number of complaints that fresh tar spoils dresses and the paint on motor cars and other vehicles.

Woolwich.—The Borough Engineer and Surveyor (Mr. J. Rush Dixon) states that during the summer of 1908 trials of various dust-laying specialities were undertaken; and he also experimented with ordinary gas tar and petroleum oil. About half-a-mile of road was treated in each case; and the experiments were all fairly satisfactory, and provided an opportunity of judging the effectiveness. This year an agreement has been entered into with the Taroads Syndicate for tar-spraying with heated tar composition about six miles of roads, at a cost of ¾d. per superficial yard, exclusive of previously sweeping the road and subsequently sanding over to blind the tar. The cost of sweeping and blinding works out at about ½d. per yard. Mr. Dixon says that the advantages of this treatment are that it serves not only as a dust palliative, and does away with constant watering, but also keeps the surface of the road well together, thereby lengthening the life of the macadam; and as it is applied by a mechanically-driven vehicle in widths of about 7 to 8 feet, roads are quickly coated and made ready to receive the ordinary traffic. He considers that it is suited equally for horse-drawn and mechanically-propelled vehicles; and so far he has not heard of any disadvantage attributable to the system.

As will be seen from the preceding answers, the engineers and surveyors who have experimented with tar-spraying are practically unanimous in favour of this method of treating gravel and macadam roads. The advantages claimed are that the road surface is preserved, disintegration is lessened, and the dust greatly mitigated. In addition, the expenditure on cleansing, watering, and maintaining tar-sprayed roads is considerably less than that incurred on roads not so treated. The noise caused by vehicular traffic is minimized; and after rain the road dries quickly. The application of the tar by hand as against machine spraying is mostly favoured. The cost varies from about ½d. to 1½d. per superficial yard, according to the method of treatment.

THE NEW RESERVOIR AT CHINGFORD.

On the occasion of the recent annual meeting of the Association of Municipal Engineers in London, a visit was paid to the reservoir in course of construction for the Metropolitan Water Board at Chingford, the commencement of which, on April 11, 1908, was noticed in the "JOURNAL" at the time. In view of the visit, the following particulars in regard to the reservoir were prepared by Mr. W. B. Bryan, M.Inst.C.E., the Chief Engineer of the Board.

The Chingford reservoir will contain about 3000 million gallons. The water area is 416 acres, and the length of embankment about 4½ miles. The embankment will be formed of material excavated from within the reservoir, and will contain 2,060,000 cubic yards of earthwork and 253,000 cubic yards of puddle. The top of the embankment will be 15 feet wide and at a level 5 feet above top water. The outer slope is 2½ to 1, and the inner slope 3 to 1 for the lined portion, and 4 to 1 below. The amount of puddle below the ground surface will be 100,000 cubic yards; the depth of the trench varying between 15 feet and 30 feet. The puddle is 5 feet wide at the top (3 feet below the top bank level), and batters on both sides for a depth of 23 ft. 6 in.; being 9 feet wide at this level. It continues this thickness until 2½ feet below the ground surface, then batters in with slopes of 1 to 1 on both sides to a thickness of 6 feet, and remains at this thickness until the London clay is reached. It then slopes in again with ½ to 1 slopes for a depth of 3 feet, forming a key into the London clay. The top portion of the inner slope will be lined with concrete, which for a distance of 4 feet below top water will be faced with brickwork. At the top of this lining a brick-faced vertical wall, 3 feet high, will be built and finished with a concrete coping, rounded off at the bottom to meet the lower portion of the lining which is formed on the slope.

The water will be pumped into the reservoir from the River Lea and the Lea Navigation at the north end through five lines of 48-inch cast-iron pipes passing up the outer slope and discharging into a chamber at the top of the embankment. From this chamber the water will pass over a long granite sill down an inclined slope into a stepped channel, which will conduct it into the bottom of the reservoir (when commencing to fill), where it will be discharged on to a concrete apron. The reservoir is divided at about the middle of its length by a central embankment without a puddle core. There will be a culvert through this embankment to allow free circulation. The outlet from the reservoir will be at the south-east corner, where the water will pass through two shafts controlled by valves, and connected by a tunnel in the London clay.

The valve-houses on the outlet-shafts will be constructed of concrete, and have domed roofs; the surfaces being treated in the manner described later on for the bridge parapets. The inner shaft will be connected to the reservoir embankment by a reinforced concrete bridge, 6 feet wide between the parapets, and 20-feet span. The parapets of this bridge will be reinforced to act as girders supporting the decking. From the outer shaft the water will pass through a line of 36-inch pipes to a chamber controlled by an automatic valve. From this chamber an outlet channel conducts the water for a distance of about two miles to an existing basin, whence it can be passed to the other reservoirs of the Board's eastern district, and afterwards to the filter-beds at Lea Bridge. From the outer shaft of the reservoir there will be a line of 36-inch scour-pipes discharging into the Lea Diversion.

The construction of the reservoir necessitates several considerable subservient works. The River Lea will be diverted for a distance of three miles through a channel 55 feet wide, with side walls of concrete faced with Kentish rag and coped with concrete blocks. Intake channels are also to be constructed of a similar nature from the River Lea and the Lea Navigation to the pumping-station at the northern end of the reservoir. A channel 3½ miles long is to be constructed along the eastern side of the works, to divert the contaminated water from the hillside, and discharge it below Flander's Weir into the old river channel. This provision was deemed advisable, as the Board abstract water for their existing reservoirs at Chingford Mill 1¾ miles below the southern end of the new reservoir.

An overflow weir has been constructed to pass flood waters from the Lea Navigation discharging into the old River Lea below the reservoir. The public road crosses this channel on a concrete bridge having three 7-feet spans. The towing path crosses the overflow weir on a reinforced concrete bridge having fifteen spans of 10 feet; it also crosses the weir supplying water to the pumps from the Lea Navigation by a similar bridge of eight spans. The Lea Valley road is to be diverted for a length of 1000 yards, and will have a surface of tar macadam.

The intake channel from the River Lea and the Lea Diversion will be crossed by five reinforced concrete arch bridges. The one carrying the public road over the Lea Diversion will be on the skew, and have three spans of 27½ feet with 5 feet rise, and a width of 40 feet between the parapet walls. The other four bridges will have single spans, one of 50 feet with a width of 6 feet between the parapets, and three of 55 feet with a width of 12 feet between the parapets; the rise in all cases being 5½ feet. The parapets of these bridges, as well as that carrying the road over the overflow from the Lea Navigation, will be of concrete, reinforced against temperature cracks with steel rods, and will be formed with panels—the large surfaces relieved by having the mortar brushed out of the concrete, leaving the stones projecting.

The amount of the contract is £340,770; but the new pumping-station for filling the reservoir is not included. Messrs. C. Wall, Limited, are the Contractors for the works.

With a capital of £1000 in £1 shares, the Etna Lighting and Heating Company, Limited, was registered last week. The Safety Auto-Light Company, Limited, with a capital of £2500 in £1 shares, was registered on the 12th inst.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Gas Committee of the Glasgow Town Council reported the other day that there had been submitted to them a memorandum prepared by the Treasurer, Mr. James Fleming, as to the pecuniary allowances paid by the Corporation to employees under the age of seventy years, and that, after considering it, the Committee agreed to recommend that the allowances set forth be granted to seventeen employees for the period till May 31 next, or for such other restricted period as might be necessary in the event of any contrary recommendation being made by a Special Committee appointed on April 29 last to consider and report as to the question of pensions and allowances to ex-officials and other employees, and which might be approved of by the Corporation. The allowances range from 5s. to 20s. per week, and amount, in the aggregate, to £9 14s. per week. The Committee also reported that they had considered a memorandum prepared by the Treasurer, showing the effect of the provisions of the Old Age Pensions Act of 1908, in regard to the allowances paid to employees of the Corporation who have attained the age of seventy years and upwards; and that they had agreed to recommend that the allowances set forth be granted to 38 employees, which would effect an annual saving of £163 3s.—to take effect for the period from Sept. 1 to May 31, 1910, or for such other restricted period as might be necessary in the event of any contrary recommendation being made. The allowances recommended varied from 5s. per week up to £52 a year. They amount, in the aggregate, to £19 5s. per week. Taken along with the allowances to employees under seventy years of age, the weekly charge upon the Corporation in respect of allowances to employees is, roughly, £30, or about £1500 a year.

The annual report by Mr. W. Ritchie, the Gas Manager, to the Corporation of Peterhead, adopted at the last monthly meeting of the Town Council, is an interesting document. Mr. Ritchie stated that since he submitted his previous year's report they had encountered a few somewhat adverse circumstances, owing to certain market fluctuations and local charges over which they had no control, and they might be well pleased that even with these adverse causes they were able to show a favourable balance. Last year the price of gas was reduced 3d. per 1000 cubic feet, equal to £524. Had it not been that they were able to make favourable coal purchases in May last year, the result might have been different. For the year just ended they had carbonized 4805 tons of coal and produced 49,427,700 cubic feet of gas—equal to 10,296 cubic feet per ton—against 4587 tons of coal the previous year, producing 46,500,000 cubic feet of gas, or equal to 10,137 cubic feet per ton. The increased make of gas, therefore, was 2,972,700 cubic feet. The total expended on coal, including freight, harbour dues, cartages, and trimming, amounted to £3787, as against £3641 for the previous year—an increase of £146. The revenue from the sale of gas was £6551, as against £6848—a decrease of £297. But were they to add the reduction of £524, they would have an increase of £226. During the year they had added to their ordinary meter consumers 84, making a total of 1591; and they had added to the number of their prepayment consumers 136, making a total of 1241. The total number of consumers on May 15 last was 2832. The total expenditure on revenue account amounted to £6426; and the contribution to sinking fund, interest, and bad debts to £1890—a total expenditure of £8316. The total receipts amounted to £8401; and there was thus a balance on the year's working of £85. For the current year they had purchased coal at 1s. per ton less than last year; and he was confident that the year would turn out favourably. Under present conditions, it could hardly be expected that any alteration could take place in the price of gas this year.

An appreciative article regarding the work at Banchory of Mr. A. Watt, who has been appointed Manager of the Alyth Gas Company, was published in an Aberdeen newspaper this week. In it the writer stated that "the approaching departure of Mr. A. Watt for the more important appointment at Alyth is a noteworthy fact for more reasons than one." He proceeds: "Only twelve months had elapsed from the date of his coming to Banchory to that which terminated his stay here; but, in the words of one of our most highly-esteemed citizens, who has several times been a Director of the Gas Company—'more improvements have been carried out by Mr. Watt during his all-too-brief tenure of office than had taken place in all the previous forty years put together.'"

In introducing the annual accounts of the Corporation Electricity Department to Glasgow Town Council on Thursday, Bailie J. W. Stewart stated that the gross revenue amounted to £245,672, and the expenditure to £104,902; the net result, after providing for interest, sinking fund, and depreciation, being a deficiency of £3544, which had been met from the reserve fund. While the revenue was rather less than in the previous year, this arose from causes which could be easily explained. In each of the two previous years there had been an increase of £30,000 in revenue; but these were record figures. The shrinkage in revenue was due to a small extent to the depression which had affected every industry in the country. It was also due to the reduction of rates conceded to certain classes of consumers, which represented a considerable saving to them. Another cause was the introduction and very extensive use of the metallic filament lamps, which they had urged their customers in their own interests to adopt. A further cause was the closing of the annual accounts eight days earlier than usual, which had resulted in a sum of £3400 of revenue not being brought into the accounts. The shrinkage in revenue had, however, been more than counterbalanced by a reduction in expenditure amounting to about £10,000, which was due to the more favourable terms on which they had purchased fuel, to a considerable extent to economies effected in the consumption of coal, and to a material reduction in standing charges—rents and taxes and general administration expenses. While the capital account had increased by £168,000, the increase was being carefully watched. They had provided during the year, as a contribu-

tion to the sinking fund, £36,308; and had written off for depreciation £53,259—in all £89,567, or about 5 per cent. of the net capital expenditure. As an indication of the progress of the department, and as showing that they had broadened the basis of their business, he mentioned that they had added 1232 new consumers (an increase of 7½ per cent.), 439 of whom were power consumers, representing in the aggregate 5757 H.P., which meant the closing down of some forty to fifty boilers and chimneys, and showed that the department was a valuable auxiliary to the Health Department of the city in their effort to purify the atmosphere.

In the subsequent remarks made by members, Mr. Cosh said he could not understand how a report could be considered satisfactory which revealed the fact that out of 32 million units sold, 22 millions (or two-thirds of the whole) were sold at less than cost price. According to the report, electricity cost 1¾d. to produce, and 22 million units were sold at 1⅓d. per unit. The result was that the parties who took the remaining one-third had to make up the deficiency on the two thirds, and were overcharged in consequence. He did not think that shopkeepers had been fairly treated by the department. Out of curiosity, he had made a note of his electricity accounts, with the following result: In 1905 his amount was (say) £100. In that year the charge was 6d. per unit up to 360 hours of maximum demand, after which the charge was 1d. per unit. At that time, he generally reached the reduced rate about the middle of December; and from then till June he had current at 1d. per unit. But the hours for the maximum demand were increased to 740, which increased his account by 30 per cent. Then he reintroduced gas, with inverted mantles; and during the last three years his average account had been 25 per cent. less than it was in 1905. Shopkeepers used a good deal of electricity—not for lighting but for advertisement purposes; and he thought they were entitled to some consideration on that account. Mr. P. G. Stewart protested against the ratepayers paying for Mr. Cosh's, or anybody else's, advertisement. He quite admitted, however, that there was a grievance, and trusted that the Committee would be able to give shorter prices to shopkeepers. Mr. W. T. Anderson considered that it was too bad that the average consumer should be compelled to burn more than 700 hours before he secured the reduced rate. The Corporation made £119,000 off this class; and he thought their claims ought to be considered. The accounts were adopted.

Death through Inhaling Coal Gas.—An unidentified visitor to Ramsgate was recently suffocated by gas in the bedroom of a lodging-house. The room was full of gas, and close to deceased's mouth was a rubber tube connected with the gas-jet; the keyhole and other means of ventilation having been carefully stopped up. Deceased had been at the house for the previous two nights. On the dressing-table was found a cutting from a newspaper reporting the suicide of a man, but no document that would serve as a clue to identity. At the inquest last Wednesday, a verdict of "Death through inhaling coal gas, there being no evidence to show the state of deceased's mind," was returned.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 21.

Sulphate of Ammonia.

The necessity for covering contracts for August shipment has occasioned good demand, and everything offered has readily been placed; the closing prices being £11 2s. 6d. per ton f.o.b. Hull, £11 3s. 9d. per ton f.o.b. Liverpool, and £11 5s. per ton f.o.b. Leith. There has also been good inquiry for delivery up to the end of the year, and a premium of about 2s. 6d. per ton has been obtainable. For delivery over the spring months, £11 10s. per ton has been paid, f.o.b. best ports; and this is the closing value.

Nitrate of Soda.

The market has been quiet, and the quotations remain 9s. 6d. per cwt. for 95 per cent., and 9s. 9d. for refined quality.

LONDON, *Aug.* 23.

Tar Products.

There is little business doing in tar products, but prices are fairly well maintained all round. Pitch is very firm indeed, with an improving tendency; and were it not for the fact that some dealers on the Continent are accepting prices under the parity of English figures, it would be very much easier to do business in that quarter. In South Wales, the consumers are fairly well bought for near delivery, and appear disposed to wait before purchasing any further quantity. Probably they are anxious to secure some of their fuel contracts before buying pitch. Creosote is quiet, and orders are difficult to obtain. At the same time, it is well known that there are numerous inquiries to come from America, which is considerably assisting the market. Benzol, 90 per cent., is steady, but unchanged in price. There is a fair demand for 50-90 per cent. benzol, but at present buyers will not pay the prices asked by the makers. Toluol is in fair demand, and has been sold at a good figure in London. Solvent naphtha is firm in London, but is not in very good demand in the North. Carbolic acid is very weak, and business has been reported at 10½d. on the east coast. Naphthalene and creosote salts are steady, and the prices are unchanged.

The average values during the week were: Tar, 16s. to 20s., *ex* works. Pitch, London, 29s. 6d. to 30s.; east coast, 29s. 3d. to 29s. 6d.; west coast, 28s. 6d. to 29s. 6d. Mersey ports, 28s. 3d. to 28s. 9d. other ports. Benzol, 90 per cent., casks included, London, 6½d. to 6¾d.; North, 5¾d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6¼d. to 6½d. Toluol, casks included, London, 8½d. to 9d.; North, 8d. to 8½d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3⅛d.; solvent naphtha, casks included, London, 10¾d. to 11¼d.; North, 9¾d. to 10d.; heavy naphtha, casks included, London, 10½d. to 10¾d.; North, 9½d. to 9¾d. Creosote, in bulk, London, 2¾d. to $2\frac{13}{16}$d.: North, 2¼d. to 2⅝d. Heavy oils, in bulk, 2⅞d. to $2\frac{15}{16}$d. Carbolic acid, 60 per cent., casks included, east coast, 10½d. to 10¾d.; west coast, 10¼d. to 10½d. Naphthalene, £4 10s. to £8 10s.; salts, 35s. to 37s. 6d.,

packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is quiet, and there has been practically no change throughout the past week. The London Gas Companies still quote £11 7s. 6d.; but it is possible to buy outside makes upon Beckton terms at considerably under this figure. In Hull, business is reported to have been done at prices varying from £10 18s. 9d. to £11; while in Liverpool, £11 1s. 3d. to £11 2s. 6d. has been accepted. In Leith, £11 5s. is asked.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a decided ease in the coal trade, more especially in steam qualities. The price of best Northumbrian steams has fallen to about 11s. 3d. to 11s. 6d. per ton f.o.b. Second-class steams are weaker at about 10s. 6d., and steam smalls are from 5s. to 6s. The fall in price is attributed to the fact that before the settlement of the labour dispute consumers laid in large stocks; and these are now being used up. The effect is less evident in the gas coal trade; for there is now the usual increase in the consumption which sets in with the autumn, and causes enhanced demand both for home use and export. Durham gas coal is quoted for the usual classes from 10s. to 11s. 3d. per ton f.o.b.; "Wear specials" being up to 11s. 6d. The shipments of gas coals are heavy at the present time. The Italian ports seem to be buying freely, and that at prices that are somewhat near those current in the market. As these current prices are often from 1s. to 1s. 3d. per ton above the values contracted for in the first few months of this year, and there is no great change in the cost of production, the sales are an improvement to the producers. Coke is firm. Gas coke is steady, with a larger output, at 12s. 9d. to 13s. per ton f.o.b. for good quality.

Scotch Coal Trade.

Orders for home consumption are exceedingly scarce—manufacturers being still engaged in working off the stocks of coal which they accumulated under fear of a strike. The prices now quoted are: Ell 9s. 6d. to 10s. 6d., splint 10s. 3d. to 10s. 6d., and steam 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 319,094 tons—an increase of 15,488 tons upon the preceding week, but a decrease of 26,390 tons upon the corresponding week of last year. For the year to date, the shipments have been 9,101,467 tons—an increase of 507,297 tons upon the corresponding period.

Proposed National Federation of Coalowners.

According to the "Iron and Coal Trades Review," private meetings of coalowners are being held in South Wales in connection with the formation of a National Federation of Coalowners. Our contemporary says: "In view of the recent wage crisis in the coal trade and ominous rumours of continued unrest and dissatisfaction among the miners in various parts of the country, special interest attaches to the progress of the movement for the formation of a National Federation of British colliery owners. The scheme was first considered at an informal meeting in London of members of the Mining Association of Great Britain, at the close of which it was agreed to put the proposal before the various local Associations. We understand it has been received sympathetically. The recent action of the Miners' Federation of Great Britain in recklessly and quite unnecessarily threatening the country with a national strike emphasizes the need of some settled understanding among employers in the coal industry. No doubt there are difficulties to be overcome in arriving at a general agreement. Troubles in one coalfield often constitute the opportunity of another; but, after all, such advantages are of a temporary character, and permanently favour no particular part of the country, since the miners are restive now in one district and then in another, so that it should be by no means impossible to draw up terms upon which the colliery proprietors of the country would undertake to sacrifice such ephemeral and doubtful benefits for those of a more solid and lasting character likely to result from an alliance of a kind which should at least enable them to present a united front financially to the Trade Unions should further occasion arise. Even if its scope were limited to this purpose only, the game would be well worth the candle."

The Lighting of Blackfriars Bridge.—The widened Blackfriars Bridge is to be lighted with inverted mantles and high-pressure gas, similar to those with which the Franco-British Exhibition was partly illuminated last year. The South Metropolitan Gas Company have the matter in hand; and when everything is complete the bridge will probably be the best-lighted one in London.

Electricity Supply in Manchester.—The following was the first of the "Electrical Notes" in the Engineering Supplement to "The Times" last Wednesday: "With 352 miles of mains and a year's sale of 67 million units, Manchester easily maintains its eminence as the most important of our municipal supply undertakings. An examination of the detailed accounts for the year ended March 31, 1909, does not, however, afford unalloyed satisfaction. The load-factor has gone down slightly, from 25·39 to 24·6 per cent.; and the revenue from light and power is diminished by over £6000. Although in this case it is fair to couple this fact with the reduction in price of current, yet such a reduction in charges is made surely as a commercial expedient for enhancing the total receipts. Manchester is evidently feeling the effect of metal filament lighting and of a check to the progress of power consumption. At the same time, the undertaking has a great future to explore, in respect of both light and power expansion; and the tendency is always favourable to reduced costs. The city's ownership of the gas-works is probably responsible for the small amount of public electric lighting, accounting for rather less than 100,000 of the 67,000,000 units sold." We agree with a correspondent who called attention to this paragraph, that the last sentence is a "candid admission."

The Proposed New Gas-Works for Belfast.

At a meeting of the Gas Committee of the Belfast Corporation on Monday last week, the City Surveyor (Mr. H. A. Cutler) submitted comparative estimates in regard to six suggested sites for the proposed new gas-works—Ormeau Park, Ormeau Park and Glentoran, Donegall Road, Cranmore, Twin Island, and Brick-Works. The first estimate gave the value of each site to the surface level, with the capitalized value of the cost of the carriage of coal for thirty years; while the second, as suggested by the Sub-Committee, gave the value of each site to the surface level with the total expenditure on coal conveyance in thirty years. After some discussion, it was resolved to hold a special meeting of the Committee for the purpose of finally considering the matter and arriving at a conclusion. The special meeting was held last Thursday, when the Gas Engineer and Manager (Mr. Robert Sharpe) submitted a report on the following points regarding the sites: (1) The area needed for the extension; (2) the character of the sites; and (3) their relative values. It was decided that the report should be printed and forwarded to each member of the Committee, together with the report of the Tramways and Electricity Committee, when received, relative to the cost of the haulage of coal over their system. It was also resolved that the members of the Committee be furnished with copies of any reports presented to the Sites Sub-Committee since Sir Alexander Binnie sent in his report on the respective sites.

Assessment of Whitby Gas-Works Reduced.—The Directors of the Whitby Gas Company have been successful in their appeal against the assessment of their undertaking; the rateable value having been thereby reduced from £1229 to £685. The Company were represented by Mr. George Buchannan (Messrs. Buchannan and Sons, Solicitors), and the Secretary of the Company, Mr. W. M. Galleway.

Gas-Works Extensions at Haverhill.—At the last meeting of the Haverhill Urban District Council, the Gas Committee reported that a letter had been received from the Local Government Board giving their sanction to the Council borrowing £1000 for extensions at the gas-works for a period not exceeding twenty years. Tenders were received from Messrs. Winstanley and Co., of King's Norton, for building a new retort-bench and new retort-house roof in accordance with specification and plans submitted, for £878 and £97 respectively; and the Committee recommended that their tenders should be accepted. This was agreed to.

Rawcliffe Gas and Coke Company, Limited.—Mr. Justice Hamilton, sitting as Vacation Judge, had before him last Wednesday a motion in a debenture-holders' action for the appointment of a receiver and manager for the above-named Company. Counsel for the plaintiffs (the Water-Works, Lighting, and Power Investment Corporation, Limited) stated that the defendant Company appeared, and, subject to his Lordship's approval, were prepared to treat the motion as the trial of the action. His Lordship appointed the gentleman named in the notice of motion to be receiver and manager, but not to act as receiver for more than three months without leave of the Court; and he made the usual decree directing accounts and inquiries.

Salford Corporation's Decreased Revenue.—From a report prepared by the Borough Treasurer of Salford, the net deficiency on the several accounts for the financial year 1908-9 was £16,195. The net gas profits of £20,048 show a decrease of £5211 compared with the previous year; the electricity profits totalled £6500, or £1500 less; and the water profits were £247, or £2171 less, attributed to decreased sales to manufacturers. The balance of assets and capital outlay over liabilities increased during the year by £72,893; and the total balance on March 31 last was £1,523,215. At the same date the mortgage debt of the borough was £3,730,476—a decrease of £17,043 on the year. During the twelve months there were fresh borrowings amounting in all to £101,050; and at the close the net mortgage debt stood at £3,475,471.

Gas Supersedes Electricity for Lighting the Brighton Railway Station.—We learn from the "Sussex Daily News" that the London and Brighton Railway Company have decided to adopt gas for the lighting of the station and the various workshops at Brighton, in place of electric light; and that they have given the contract to the Brighton and Hove Gas Company, who will commence the work forthwith. This is a decided "score" for the Company, as exceptionally favourable terms were offered for the supply of electricity by the Corporation. The system to be installed is the most up-to-date high-pressure one; and when completed the station is expected to be one of the best lighted in the country. At the same time a considerable saving in cost is anticipated. The installations will be carried out by the James Keith and Blackman Company, Limited.

Lighting of Keady (Co. Armagh).—Last Thursday, Mr. A. D. Price, one of the Inspectors of the Local Government Board for Ireland, held an inquiry into an application made by the Urban District Council of Keady for a loan of £2000 for erecting new gas-works and plant. The Clerk (Mr. Peter M'Knight) stated that the Council had purchased the gas-works from the Keady Gas Company at 3s. 9d. per 20s. share, and the capital of the Company was £700. They thought they had made a good bargain. They had acquired a site for the new works for £100. The town was progressing, as the census showed the population for 1901 to be 1468 and now 1550. The average annual cost for lighting the town for the last four years was £42. Mr. James Whimster, of Armagh, said he had drawn the plans and specifications for the Council, and estimated the cost of the erection of the works at £2479. The net profit in a few years should work out at £126 per annum; the charge for gas to be 5s. 5d. per 1000 cubic feet. The Chairman of the Council (Mr. G. M'Bride) said the town was growing in prosperity, and a good supply of gas was urgently needed. Half the town had to be lighted by oil. A new bakery was in course of construction, and it had been arranged to instal a 17½ H.P. gas-engine. The present works had been over sixty years in existence, and were simply useless to supply the town. There were only 34 inhabitants who had gas laid on, and there were 455 houses which would have it if a proper supply were given. The present price was 7s. per 1000 cubic feet. There was no opposition to the application.

A "Slump" in Electricity.—"Electrical Industries" says: "The problem which is facing us to-day concerns methods to be adopted in order to induce the public to use an increased quantity of electricity in suitable auxiliary apparatus, and thus at least to maintain quarterly bills at their old level, or, better still, to show a healthy financial increase."

Water-Works for Liss.—The Rural District Council at Petersfield have received a report in regard to the completion of the water-works for Liss. The total cost has been £7716; and as a further loan is required, the Local Government Board are to be asked to authorize the borrowing of £700, while the remaining £16 is to be paid out of the current rate.

Water Supply in the Camborne District.—There have lately been serious complaints by the residents at Beacon and Illogan Highway in regard to the water supply, which is in the hands of the Camborne Water Company. The Directors have for some time had the matter under consideration; and with the view of improving the service, they have embarked on an expenditure of £10,000.

"Marcus" Coke Screen-Conveyors for Croydon.—Messrs. Head, Wrightson, and Co., Limited, have received an order for two "Marcus" coke screen-conveyors for the Croydon Gas-Works. Each screen is 3 ft. 6 in. wide and 63 feet long, and is capable of dealing with 30 tons of coke per hour. This is the first installation of this screen-conveyor received for gas-works; but its value for conveying and classifying coal and coke has been demonstrated in many installations connected with coke-ovens and colliery plants.

Early Days of Gas Lighting at Taunton.—In connection with the notice of the annual general meeting of the Taunton Gas Company which appears elsewhere, it may not be without interest to reproduce from the "Correspondents' Replies to Queries" in the "Somerset County Herald" for the 14th inst. the following particulars in regard to the original Company: "A good many dates in the history of Taunton can be fixed by the journals of the House of Commons. On Feb. 12, 1845, a petition was read from the inhabitants of the town and neighbourhood for leave to bring in a Bill for better supplying Taunton with gas. On the 3rd of March, the Market Trustees sent up a petition praying that the Taunton Gas Bill might not pass into law. On the 17th of April, shareholders in the Taunton Gaslight Company prayed to be heard against parts of the Taunton Gas Bill. On the 30th of June, the Bill was passed. This was the only Taunton Gas Bill introduced into the House of Commons. No doubt the Taunton Gaslight Company which protested against the Taunton Gas Bill of 1845 was formed under powers possessed by the Market Trustees for cleansing and lighting the streets. During the first part of the reign of George III., the only Lighting Bills were those to enable the inhabitants of specified districts to light and watch the streets during certain hours of the night."

Rural Water Supplies in Devonshire.—Inquiries were held last week by Mr. E. A. Sandford Fawcett respecting applications by the Tavistock Rural District Council for the Local Government Board's sanction to loans for works of water supply for the parishes of Peter Tavy and Mary Tavy, on the borders of Dartmoor. In both cases the population is small, and the sums proposed to be borrowed were £260 for the former and £1660 for the latter place. Opposition was offered to the expenditure of money at Peter Tavy, on the ground that it is unnecessary; there being an abundant supply of water at the public wells. The Inspector asked if it would not be convenient to people to have taps near their own houses; to which the spokesman for the opposition replied that he thought they would rather go to the wells. In the case of Mary Tavy, Mr. H. F. Bellamy produced plans of a scheme including a reservoir to hold 45,000 gallons, and afford a daily supply of 10 gallons per head. A number of ratepayers offered opposition to the scheme, chiefly on the ground that they would not directly benefit by it, though they would have to pay a large proportion of the cost. The Inspector said it was useless to contend that the water supply was not necessary, for the Local Government Board had for years been pressing for a scheme to be carried out. The opponents of the project replied that they considered that those who were to benefit by it should bear the cost, and that instead of a general rate over the whole parish the cost should be met by a special water-rate paid by the consumers. It was also suggested as an alternative to the present proposals that the District Council should enter into an arrangement with the War Office to supply water for the parish from the Government reservoir in the district.

Suicides by Coal Gas.—At a new shop in Oxford Road, Reading, a man's dead body was found under circumstances which pointed to suicide. He was lying on the floor of the scullery, all the windows and doors of which had been closed and the gas turned on; the result being that he was asphyxiated. The unfortunate man had previously attempted to take his life in a similar way at Merthyr. A sad case of suicide was investigated at the Westminster Coroner's Court on Friday. The inquiry had reference to John Volkes-Cooper, aged 47, a brewer's drayman, of South-East Block, Peabody Buildings, Buckingham Gate. The widow stated that deceased had complained of the heat and pains in his head; he had never threatened his life. On the previous Monday morning witness went to work, and upon returning at midday found the doors of their rooms locked and the windows closed, which was very unusual. Entering the bedroom, she found it full of gas, and noticed that the gas-burner had been removed, and that the tap was full on. Her husband was lying on the bed partly dressed, and she saw no sign of life. He had met with several accidents. The Coroner's officer stated that he had made inquiries at Messrs. Meux's brewery, and ascertained that the deceased had been discharged. Dr. Trevor, who made a post-mortem examination, stated that death was due to coal gas poisoning. Deceased had sustained injuries to his head, which might have given rise to irritability. The Jury returned a verdict of "Suicide during temporary insanity." An inquest was recently held at Lewisham on the body of Francis Henry Darker, an optician, who was found dead in his workshop, which was full of gas. The burner over the bench had been removed, and an india-rubber tube attached, the end of which was in deceased's mouth. A verdict of "Suicide while of unsound mind" was returned.

The Directors of Crossley Bros., Limited, Manchester, recommend an interim dividend on the ordinary shares of 2 per cent. (actual), against 2½ per cent. for the first half of 1908.

By a ailure of the electric light at King's Lynn, Norfolk, last Saturday night, large parts of the town were in complete darkness, while shops were lit by candles and stable lanterns.

The Local Government Board have sanctioned the raising of loans for £6400 for gas-mains and £3200 for meters, repayable in thirty and ten years respectively, by the Mansfield Corporation.

The gas authorities of Hamburg have placed a repeat order with the Ofenbau Gesellschaft of Munich for Munich chambers to produce 3,800,000 cubic feet of gas per diem. The new plant will be erected at the Grasbrook works at Hamburg; and it will bring up their chamber carbonizing plant to 500 tons of coal per 24 hours.

The construction of the subways in connection with the widening of Blackfriars Bridge has cost about £10,000; while the alteration to the electricity, gas, and water mains in the streets and in the pipe subway of the London County Council has entailed the expenditure of another £20,000. The total length of the two subways will be 500 feet; and they are now nearing completion.

The premises of the Edinburgh and Leith Gas Commissioners in New Street, Edinburgh, have now been closed; and notices have been issued that the new address of the Chief Engineer and Manager (Mr. W. R. Herring) is Calton Hill, Edinburgh, the administration of all the departments of the undertaking being now concentrated within buildings situated at Calton Hill, immediately at the back of the general offices in Waterloo Place.

APPLICATIONS FOR LETTERS PATENT.

18,302.—Midgley, J. A., "Gas-engines." Aug. 9.
18,334.—Noad, J., "Distilling shale and other bituminous substances." Aug. 9.
18,380.—Wright, E. T., and Skidmore-Westwood, W. W., "Gas valve-operating mechanism." Aug. 10.
18,413.—Jones, A. O., "Quenching coked products." Aug. 10.
18,435.—Edwards, A. N., "Controlling a conduit for gas." Aug. 10.
18,455.—Parker, C. H., "Dip-pipes." Aug. 10.
18,487.—Green, H. R., "Taps and valves." Aug. 11.
18,490.—Prockter, F. M., "Joining the ends of pipes or tubes or attaching such pipes or tubes to other apparatus." Aug. 11.
18,492.—Koenig, J., "Flexible pipe connections." Aug. 11.
18,493.—Koenig, J., "Pipe connections." Aug. 11.
18,516.—Felchlin, A., "Acetylene gas-burner." Aug. 11.
18,591.—Giorgi, A., "Inverted incandescence gas-lamps." Aug. 12.
18,593.—Izod, H. W., "Manufacture of ozonized and (or) oxygenated carburetted vapour or gas." Aug. 12.
18,656.—Chandler, S. & J., "Grids for gas-purifiers." Aug. 13.
18,679-80.—Dier, F. F., and Primeau, M., "Gas-lighting appliances." Aug. 13.
18,683.—Chipperfield, W. H., "Intermittent supply of gas to burners, particularly applicable to advertising purposes." Aug. 13.
18,761.—Norman Dickin and Cook Gas Engineering Company, Limited, "Regenerative gas-burner for use with incandescent mantles." Aug. 14.
18,764.—Humphrey, A. A., "Carburetting air." Aug. 14.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

Engineer, Works' Manager, and Draughtsman. Hapgoods, Limited.
Visiting Teacher of Advanced Gas Supply. London County Council.
Working Manager. Coleshill Gas Company.
Traveller. No. 5127.

Pupil Required.

(Midlands). No. 5126.

Plant (Second-Hand) Wanted.

Annular Condensers, &c. Aylesbury Gas Company.

Plant, &c. (Second-Hand), for Sale.

Boiler, Engine, and Washer. Dorchester Gas-Works.
Carburetted Water-Gas Plant, Including Condensers and Tower Scrubber. Shanghai Gas Company.
Station Meter and Governor. Widnes Gas-Works.

Patent Licences.

Acetylene Generators, Lamps, &c. Haseltine, Lake, and Co., Chancery Lane, W.C.
Retort Charging Apparatus. Haseltine, Lake, and Co., Southampton Buildings, Chancery Lane, W.C.

Meetings.

Harrow and Stanmore Gas Company. Holborn Restaurant, Sept. 6, Twelve o'clock.

Spent Oxide.

Seaford Gas Company.

TENDERS FOR

Coke.

Rhondda Gas and Water Department. Tenders by Sept. 2.

Cookers, Heating Stoves, &c.

Belfast Corporation. Tenders by Sept. 9.

General Stores (Iron and Steel Cocks, Shovels, Waste, Gaskin, Oil, Brooms, Lime, Glass, &c., &c.).

Bradford Gas Department. Tenders by Sept. 16.

Lamps, Burners, Fittings, &c.

Belfast Corporation. Tenders by Sept. 9.
Bradford Gas Department. Tenders by Sept. 16.
Fulbourn Asylum, Cambridge. Tenders by Aug. 28.

Meters, &c.

Belfast Corporation. Tenders by Sept. 9.
Bradford Gas Department. Tenders by Sept. 16.

Pipes, &c.

Bradford Gas Department. Tenders by Sept. 16.
Fulbourn Asylum, Cambridge. Tenders by Aug. 28.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

SMART Traveller wanted to call upon Gas Companies in the West of England, to REPRESENT a Manufacturing Firm of Gas Fittings, Street Lighting, Meters, &c.
Kindly write, giving full Particulars, Salary required, Experience, &c., to No. 5127, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager for a Small Country Gas-Works. Make, about Three Million Feet. Must be a good Stoker, and able to Lay Mains and Services and see to Fittings.
Apply not later than Sept. 8, giving Three recent Testimonials and stating Wages required.
Address the SECRETARY, Coleshill Gas Company, Limited, Coleshill, WARWICKSHIRE.

COUNTY OF LONDON.

THE London County Council invite APPLICATIONS for the Post of VISITING TEACHER of ADVANCED GAS SUPPLY at the L.C.C. Westminster Technical Institute, Vincent Square, S.W., for One Evening a Week. Fee, 21s. an attendance of about Three Hours.
Applications should be made on Form T. 17, to be obtained from the Education Officer, London County Council Education Offices, Victoria Embankment, W.C., to whom they must be returned not later than Eleven a.m. on the 11th of September, 1909, accompanied by *copies* of Three Testimonials of recent date.
All communications on the subject must be endorsed "T. 1.," and a stamped addressed foolscap envelope must be enclosed.
Canvassing, either directly or indirectly, will be held to be a disqualification for employment.

G. L. GOMME,
Clerk of the London County Council.

L.C.C. Education Offices,
Victoria Embankment, W.C.,
August, 1909.

WANTED, a Set of Good, Second-Hand ANNULAR CONDENSERS, with 12-inch Valves and Connections Complete.
Particulars to G. LANE, Gas-Works, AYLESBURY.

PURIFIERS—Set of Four, 12 feet Square, fixed complete, £300. A bargain. Also Four 6 feet Square, Two 8 feet, Four 8 feet, and Two 12 feet square PURIFIERS. Cheap.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

GASHOLDERS—Splendid, 45 feet dia- meter, and New STEEL TANK fixed complete, £600 to Plan and Specification. Also 50 feet Single-Lift and 50 feet Double-Lift. Cheap, with STEEL TANKS. Can be seen temporarily erected.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

WASHERS and Scrubbers — Two "Livesey" WASHERS. One "Clapham" WASHER. TOWER-SCRUBBERS, 3 ft. 6 in. by 16 ft., 5 ft. by 16 ft., and 7 ft. diameter by 55 ft. high. Sold at Bargains, being overstocked.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

CONDENSERS—Clapham's, also Cutler's Water-Tube CONDENSERS. Pipe CONDENSERS, 4-inch to 10-inch diameter. Annular CONDENSERS, 8-inch, 10-inch, and 12-inch. Erected Complete and Cheap.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

STATION Meters and Governors— Several in Stock, 4-inch to 18-inch, with New Drums. Prompt Execution.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

PUMPS, Tanks, &c.—Two and Three- throw PUMPS, Belt or Steam Driven, and Single and Double-acting Verticals and Horizontals. Large Stock of Tanks and all Sundries.
FIRTH BLAKELEY'S, Thornhill, DEWSBURY.

SHANGHAI GAS COMPANY, LIMITED.

THE Shanghai Gas Company, Limited, have for Disposal Two Sets of Humphreys and Glasgow's CARBURETTED WATER-GAS PLANT which have become too small for the Company's requirements, and have been displaced by a larger Plant.
Each set is capable of an output of 225,000 Cubic Feet per Twenty-Four hours.
The Plant is complete in every respect, and includes an Extra Set of Annular Condensers, and a Tower Scrubber, together with all necessary Valves and Connections.
Further Particulars can be obtained from the undersigned.

H. KING HILLER,
Engineer-in-Chief.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

TENDER FOR GAS COKE.

THE above Council invite Tenders for the Purchase of the whole or part of their Surplus GAS COKE, estimated at 3500 to 4000 Tons, for the Twelve Months ending the 31st day of August, 1910.
Specification and Form of Tender may be obtained on Application to Mr. Octavius Thomas, Engineer and Manager, Gas and Water Offices, Pentre, Rhondda.
Tenders to be sent in not later than Ten a.m. on Thursday, Sept. 2, addressed to the Chairman of the Gas and Water Committee, endorsed "Tender for Gas Coke."
The Council do not bind themselves to accept the highest or any Tender.

WALTER P. NICHOLAS,
Clerk.

Council Offices, Pentre,
Rhondda, Aug. 17, 1909.

FOR SALE—A 20,000 Cubic Feet per hour STATION METER, with 12-inch Valves and Connections Complete. Good Condition. Also a 14-inch STATION GOVERNOR (W. Cowan's Patent).
Further Particulars from the GAS-WORKS, WIDNES.

THE Seaford Gas Company, Limited, have for DISPOSAL about 25 Tons of SPENT OXIDE.
Further Particulars may be obtained on Application to the MANAGER.

FULBOURN ASYLUM, CAMBRIDGE.

GAS-FITTING.

TENDERS are invited by the Visitors for NEW FITTINGS, BURNERS, and MAINS, &c., at the above.
Bills of Quantities, Schedule, and Plans may be obtained from the Architect on payment of a deposit of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender and Fully Priced Quantities.
Tenders to be delivered, in envelopes provided, not later than Nine o'clock on Saturday morning, Aug. 28, 1909.
The Visitors do not bind themselves to accept the lowest or any Tender.

A. P. MACALISTER, F.R.I.B.A.,
Architect to the Visitors.

20, St. Andrew Street,
Cambridge.

CITY AND COUNTY BOROUGH OF BELFAST.
(GAS DEPARTMENT.)

TENDERS are invited for the Supply of GAS COOKERS, HEATING STOVES, FITTINGS, and other APPLIANCES for One Year from Oct. 1, 1909.
All Goods must be delivered free into the Corporation Stove Warehouse, and Empties will be returned Carriage forward.
Tenders, endorsed "Tender for Gas Appliances," will be received by the Town Clerk, City Hall, not later than the 9th of September, 1909.
The lowest or any Tender not necessarily accepted.

ROBERT SHARPE,
Engineer and Manager.

Gas-Works, Belfast.

CITY AND COUNTY BOROUGH OF BELFAST.
(GAS DEPARTMENT.)

TENDERS are invited for the Supply of DRY METERS (Ordinary and Prepayment) for One Year from Oct. 1, 1909.
Conditions and Form of Tender may be had on Application to the undersigned.
Tenders, endorsed "Tender for Meters," will be received by the Town Clerk, City Hall, not later than the 9th of September, 1909.
The lowest or any Tender not necessarily accepted.

ROBERT SHARPE,
Engineer and Manager.

Gas-Works, Belfast.

CITY OF BRADFORD.

TENDERS FOR STORES.

THE Gas Committee of the Bradford Corporation are prepared to receive TENDERS for the Supply of the following STORES required in their several Departments during a period of One Year ending Sept. 30, 1910:—

PROBABLE QUANTITY REQUIRED.

Wet and Dry Gas-Meters.
Pipes and Castings.
Wrought-Iron Steam Tubing.
Best Merchant Iron and Steel, 30 tons.
Charging Shovels, 70 dozens.
Oxide Wiskets, 25 dozens.
Cotton Waste, 60 cwt.
Best Engine Oil, 1500 gallons.
Common do., 1800 gallons.
Cylinder Oil, 1000 gallons.
Tarred Gaskin, 90 cwt.
Brass Main Gas Cocks, 160 dozens.
Weed Brooms, 72 dozens.
Best Lime, 120 tons.
Copper Lamps, 500.
Lamp Irons, 300.
Sheet Glass (English) for Street-Lamps, 21 oz., 9000 sq. feet.
Opal Glass for Street-Lamps, 21 oz., 3500 sq. feet.

Form of Tender, with any further Information required, may be had on Application to Mr. Chas. Wood, Gas Engineer, Town Hall, and Samples may be seen at Mill Street Gas-Works.
The Contracts will be let subject to the Fair Contracts Clauses of the Corporation, which may be seen at the Town Clerk's Office, and which the accepted Contractors will be required to sign.
Tenders, endorsed "Tender for Stores," to be sent to me not later than Thursday, Sept. 16.
The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Hall, Bradford,
Aug. 16, 1909.

THE Proprietor of the Patents No. 7188 of 1901, for "IMPROVEMENTS IN OR RELATING TO ACETYLENE GAS-LAMPS or GENERATORS;" No. 11,612 of 1902, for "ACETYLENE GAS-LAMP for TABLE USE;" No. 23,629 of 1903, for "IMPROVEMENTS IN ACETYLENE GAS-GENERATORS;" No. 10,185 of 1905, for "IMPROVEMENTS IN ACETYLENE GAS GENERATORS" is desirous of entering into Arrangements, by way of LICENCE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring their Full Development and Practical Working in this Country.
All Communications should be addressed in the first instance to HASELTINE, LAKE, AND CO., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

THE Proprietor of the Patent No. 11,145 of 1901, for "IMPROVEMENTS IN GAS-RETORT CHARGING APPARATUS" is desirous of entering into Arrangements by way of LICENSE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.
All Communications should be addressed in the first instance to HASELTINE, LAKE, AND CO., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, LONDON, W.C.

HARROW AND STANMORE GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Proprietors will be held at the Holborn Restaurant, 218, High Holborn, London, on Monday, the 6th day of September, 1909, at Twelve o'clock precisely, to receive the Directors' and Auditors' Reports; to declare a Dividend; and to transact any Ordinary Business of the Company.
The REGISTER OF TRANSFER BOOKS WILL BE CLOSED from Aug. 31 until Sept. 6, both inclusive.
AND NOTICE IS HEREBY GIVEN, that an EXTRA ORDINARY GENERAL MEETING of the above Company will be held at the Holborn Restaurant, 218, High Holborn, London, on Monday, the 6th day of September, 1909, immediately on the conclusion of the Business of the Ordinary General Meeting to be held on the same day, for the purpose of considering, and if deemed expedient passing, a resolution to authorize the Directors to issue a further £33,000 of Additional Capital and to borrow, by the creation of Debenture Stock, £11,000 in respect of such Additional Capital in pursuance of the Acts of Incorporation in such manner and at such times as they may determine.

By order of the Board,
J. L. CHAPMAN,
Secretary.

Gas Office, Roxeth, Harrow,
Aug. 17, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

MUNICH

INCLINED CHAMBERS.

Sole Agents and Licensees for Great Britain and Colonies:

The Coke Ovens & By-Products Co., LTD.,
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Westminster, LONDON, S.W.

HEATHCOTE GAS COAL

from the

GRASSMOOR COLLIERIES,

CHESTERFIELD.

Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

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Testing Instruments

ALEXANDER WRIGHT & CO., LD.
WESTMINSTER.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

JOHN HALL & CO. OF STOURBRIDGE,

LIMITED,
STOURBRIDGE,
Manufacturers of

FIRE-BRICKS, LUMPS, TILES, GAS RETORTS,

And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

TROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE, LIMITED,

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: H. CRESSWELL & Co., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

'BUFFALO' INJECTOR

Operated Entirely by One Handle.

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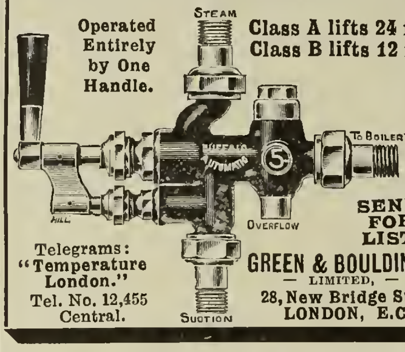

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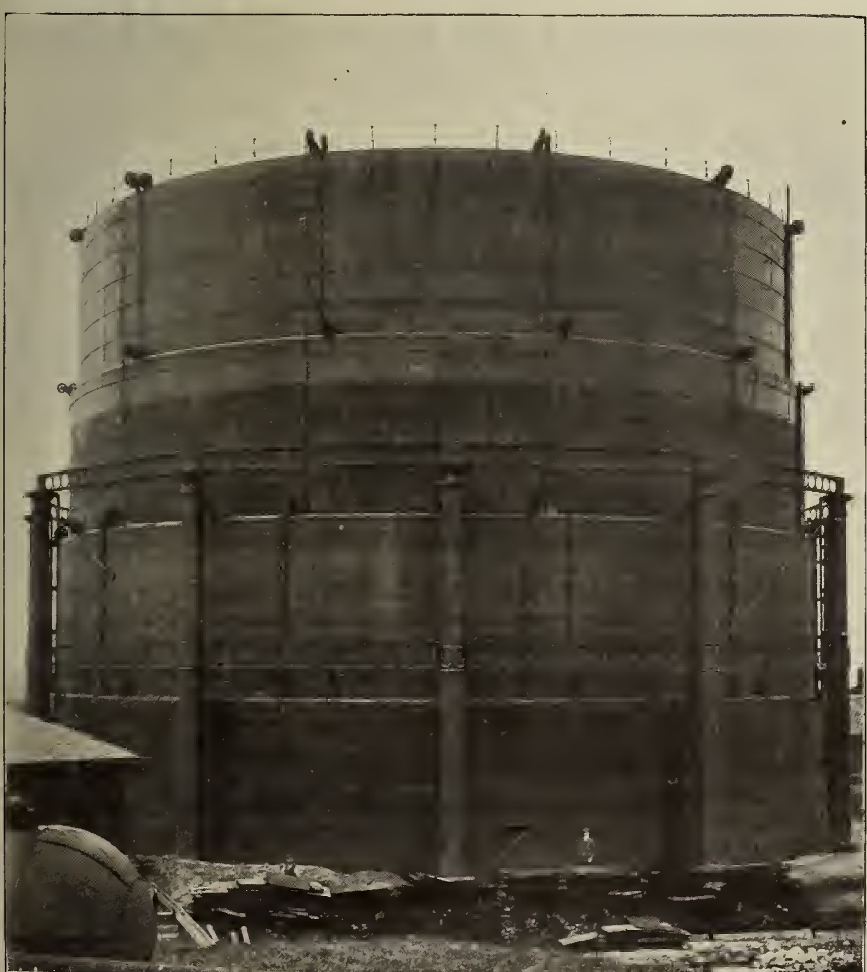

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THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CVII. No. 2416.] LONDON, AUGUST 31, 1909. [61ST YEAR. PRICE 6d.

[See Illustrated Advertisement, Aug. 10, p. 420.]

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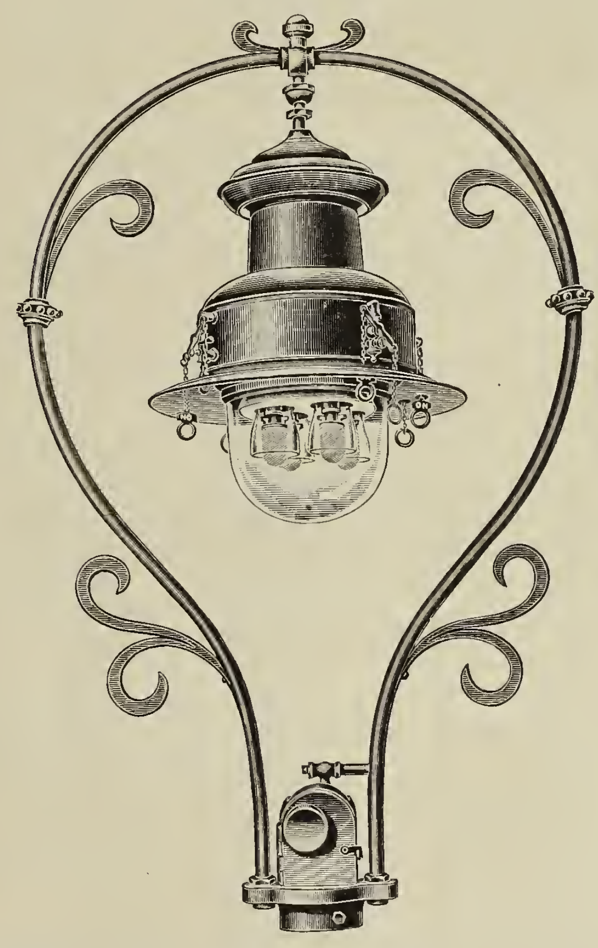

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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VOL. CVII., No. 2416.——TUESDAY, AUGUST 31, 1909.

EDITORIAL NOTES—GAS, &c.

Points from the Session's Work.

'he session of Parliament which is being stretched to such ıordinate length in the hope, if the House of Lords is avourable, of getting through the Finance Bill and a few ther measures, has not been a particularly happy one. On ie side of public business, there has been far too much to o; and, owing to the revolutionary character of the financial lans of the Government, very little solid work has been ccomplished. On the side of private business, the con- atenation of lean years has remained unbroken; and the uantity of work in the Committee rooms has been at low- ·ater mark. From the economic standpoint, the latter is ot a condition to be much regretted; but a sequence of lean ears such as there has been in private promotions does not ɜll a tale of fulgent industrial conditions, and that is a source f keen concern. That the work in the Committee rooms has ot been of the magnitude commonly experienced some few ears ago, may be taken to be due partly to this lessened mount of promotion, and partly to the growing good sense f those directing the interests involved in the schemes sub- ıitted for parliamentary authorization, and which growth in ood sense enables them to come to understandings that are f mutual benefit and service in preventing an undue waste f money in contests at Westminster. There is unquestion- bly, too, a greater confidence in the parliamentary authori- es to whom Private Bills are referred. There have been ıany indications within quite recent years of an intention, ıough Bills are unopposed, not to allow promoters to exceed ıecedent and fair requirement without proof of necessity or ıtility. Nevertheless, in certain respects the authorities ave not been oblivious of the fact that the mutations of ime make legislative change imperative; and though they re slow-moving and tardy at times, and those interested re correspondingly impatient, in the result that which is re- uired is realized.

This has been seen in the past session in at least three espects. For long, there has been a well-sustained attack n the outstanding inducement to municipal trading—that s, not good service, but profit-making to, according to subtle allacy, "aid the rates," and (although not freely admitted) ndulge the fancy for prodigality on the part of certain town ouncillors at other people's expense. The latter is an ex- ɔanding evil with the growth of democratic and commun- stic doctrines, and with the pandering, frequently unwisely, o class gratification by those who get into power by sowing he seeds of discontent. Not all—thankfully we say it— nunicipal councillors are of this type; but the growth in ɔower of the wreckers of wise local government most unfor- unately means the displacement of those who are actuated y personal or class motives. That in the branch of muni- ipal trading concerned in gas production and distribution, here has been good service, has been, firstly, due to the ood fortune of the undertakings in being largely kept so ong out of the hands of the types of councillors who sink ɔolitic administration to advantage their own ends, and, econdly, to the loyalty of the technical officials to the in- erests entrusted to their care. But against the increasing ɩscendency of profit-making in municipal trading, there has ɔeen, as we were saying, well-directed attack; and reward ıas come at last, in the manifestation of a parliamentary ntention to right this particular wrong, and to set a limit o the extraction of profits from gas consumers to apply to ɔurposes that should legitimately be borne, in proper share, ɔy every class of the community. There are great and un- ɩnswerable reasons why more than ever before this should ɔe insisted upon to-day. One is the preponderance, numerally, of the poorer class of householder in gas consumption; and another the fact that the competitors of gas are not taxed in the same manner—municipal electricity supply contributes but sparingly to the rates; and oil and coal, not being under municipal control, contribute nothing in any similar manner. Those of our readers who are not directly concerned, tech- nically or administratively, in gas manufacture and distribu- tion, will understand this reference to coal better when it is mentioned, that gas undertakings to-day, including many in purely residential areas, send out something like 50 per cent. of their production in the hours of daylight.

However, municipal profit-sharing renders the incidence of taxation, inequitable; and the trend of things was towards enlargement of the inequality. Parliament has intervened, and not too soon. In the House of Lords in the case of the Salford Bill, and in the House of Commons in the Oldham Bill, definition was given this session to the amount of gas profits that could be appropriated, and both authorities were instructed to in future make public lighting a charge upon the common funds, and not in any part upon the gas under- takings, and through the undertakings upon their patrons. Municipal composure, and municipal belief in the sanctity of their ways in this regard, were sadly ruffled; so much so that—the House of Commons authorities being as obdurate as the House of Lords in declining to allow the withdrawal of the gas section of the Bill—the Salford Corporation threw overboard the whole measure, as well as the expense incurred by themselves and by the opposition, for the one purpose of preserving their "full pound of flesh" from the gas profits. The Oldham Corporation took their limitations in a more philosophic spirit. Salford are proposing to promote their Bill again next year, *minus* the gas section; and there is rumour that the outside authorities within the district of gas supply have in contemplation the promotion of a Bill to give legislative effect to the decision of the House of Lords this session. If they persist in this intention, it will open up a source of more than local interest; and we shall be among those who will wish them success. Meanwhile, the Salford Corporation are in humiliated spirit.

In another matter, a change has come over the legislative scene. For some years now attempts have been made to obtain, both through Gas Bills and by advocacy in these columns, protection for gas undertakings in relation to stand- by supplies. Perseverance has been rewarded by the creation of precedent this session. It was an anomalous condition of things that gave legislative protection in this matter to elec- tricity, and refused it in the case of town's gas. There was no reply on the part of the parliamentary authorities to the charge of inconsistency; and at length they have yielded to justice. In both the Heywood and Mountain Ash Bills, pro- tection and rights have been given to the gas undertakings— in the former instance not only in respect of private gas plants, but in cases where gas is made to serve as a stand-by to electricity. Promoters of gas measures in the coming session will do well to read the report in our columns of what transpired in Committee in connection with the successful plea for protection of the Heywood Gas Department. The neces- sity for protection may not have been felt by some gas under- takings; but those in industrial districts never know when the possession of such powers may be useful—especially if, through stand-by service, they encounter the spasmodic big demands that the Heywood undertaking has of late years experienced. The possession of such protective powers does not compel their exercise.

A third matter, in which the parliamentary authorities have taken a more lenient view than before, has been in the supplementary power granted to make extra charges, within specified limits, in the case of unprofitable prepayment con- sumers. There is not the material for such a strong case to be constructed out of this, as there is in the matter of stand-by

supplies; for the simple reason that there are well-founded objections to the complication of the prepayment system, having in view the class of consumers affected. Here again circumstances alter cases, and lessen or strengthen the usefulness and necessity for such powers. In the Bury, Heywood, and Mountain Ash Bills of this session, clauses that enable the gas suppliers of the towns to protect themselves and their profit-producing prepayment consumers have been allowed.

These are points in which the authorities of the Houses of Parliament have performed a right-about-face evolution during the session. They are changes all more or less desirable, and having their justification centred in altered circumstance. With them, the further review of the work of the session may be postponed for a week.

From Peak to Peak.

To those whose mental calibre and interests permit them to find delight in treading the paths of the higher scientific realms, the address of the President of the British Association (Sir J. J. Thomson) last Wednesday, in far-off Winnipeg, will be a source of great pleasure; but, in the main, the subject of the address is not such as comes within the purview of the "Journal." The structure of matter and of electricity, the energies of the universe, the ether of space, and radio-activity, were of the principal themes of the address; and these are all subjects that have merely a bordering interest upon the topics which affect the industrial work of our readers. Treating of them, determinate knowledge is found in the address; and upon that knowledge, the President places hypotheses and from it visions potentialities. Considerable progress has been made in the arduous task of discovering what is the structure of electricity; and further knowledge is being actively searched for which will, it is hoped, give the material for constructing what may be called the molecular theory of electricity, and this would be a starting-point for a theory of the structure of matter. We are completely in the hands of the scientists and physicists in advancing our knowledge of such things. It is they who must track the course of development; and the workers in more material matters must devise the practical ways and means of giving mankind the benefit of the fruits of their profound and enlightening research.

There is the lavish supply of the energy of the sun; and the man of commonplace intelligence will probably regard as fantastic the vision of a greater share of that energy being brought under control by our engineers, and applied to the service of man. Already the world's work is done by the energy stored in coal, in waterfalls, and in food. But this gift of Nature is not treated, the President thinks, with sufficient consideration. Her lavishness in this regard, leads to lavish waste on the part of mankind. But whence are to come the means by which economy is to be obtained through conservation and application? It is computed that the heat received under a high sun and a clear sky is equivalent to about 7000-horse power per acre of land. How much of this is doing work for present and future generations, and how much is being wasted, no one can tell. But the erudite President has "not the slightest doubt" that our engineers will ultimately succeed in discovering how to utilize this enormous supply of power; and when coal is exhausted and water power is inadequate, "it may be that this is the source "from which we shall derive energy for the world's work." This is forecasting well ahead. But it is to the thinkers and the theorists, and the searchers into the esoteric, that there is indebtedness for their directive influences. And the new discoveries which succeed, and the further ideas and potentialities suggested by them, have a stimulating effect upon the workers. And so the history of development is made. Words from the lips of Sir J. J. Thomson, bearing on this point, can be applied to the gas and other industries as well as to pure science: "There never were," he says, "any signs "of an approach to finality in science. As we conquer peak "after peak, we see in front of us regions full of interest and "beauty. But we do not see our goal; we do not see the "horizon. In the distance tower still higher peaks, which "will yield to those who ascend them still wider prospects." The words, simple and expressive, are both inspiriting and impelling. In our special industrial work, it cannot be said that we have yet seen the signs of finality in any one direction. This being so, in it, we may (as those in the higher branches of science) work to conquer peak after peak, with courage, with enthusiasm, and with confidence in the future.

Income-Tax Allowance in Respect of Depreciatio[n]

A matter of considerable importance to gas undertakin[g]s has been opened up by a letter in our "Correspondence" columns from Mr. W. A. Schultz, who is identified wit[h] various Gas Companies—the Ascot among others. It is [a] question over which there should be no delay in taking co[l]lective action, through the Institution of Gas Engineers. [A] few years ago our correspondent secured, on appeal befor[e] the Special Commissioners, in connection with assessment for income-tax, an allowance of 3 per cent. on the prese[nt] value of all gas plant and machinery belonging to the Com[-]panies with which he is identified. But now the Boar[d] of Inland Revenue, who are a body of less degree in thi[s] matter than the Commissioners of Taxes, have instructe[d] their Surveyors not to allow any depreciation in any circum[-]stances in respect of any portion of gas and water under[-]takings. But repairs and renewals (excluding extension[s] and improvements) are to be allowed as working expenses as and when incurred. It would be interesting to ascertai[n] whether there is any union between this decision of th[e] Board of Inland Revenue and the resolve of the parliamen[-]tary authorities last session not to again allow a renewal[s] clause in connection with gas undertakings, but to institut[e] a special purposes fund for certain defined objects. Whethe[r] or not the earlier decision has any association with the in[-]ception of these fresh instructions to the Surveyors of Taxes is not clear; but the best that can be said for them is tha[t] they are monstrous, and that, if not annulled, they will giv[e] rise to much dispute and necessity for appeal.

The position created once again emphasizes the ridiculous inconsistency with which the affairs of the departments deal[-]ing with the collection of the national revenue are directed. Only a few weeks ago, Somerset House agreed with repre[-]sentative bodies of the electrical industry that, in respect of cables, allowance for depreciation, in assessing for income-tax, may be granted at the rate of 3 per cent. per annum on the written-down value; and on all other plant (exclusive of loose tools, meters, and office furniture) depreciation may be allowed at the rate of 5 per cent. per annum on the written-down value, in addition to the cost of repairs. It is difficult to even surmise what are the distinctions drawn in the official mind between the gas and electrical industries, that the one should be treated on such a different basis from the other. Certain it is that there is no legitimate reason for it. The incongruity proposed to be established in this instance is an extreme absurdity. If the difference is allowed to stand, the Ascot Company (who supply both gas and electricity) would be entitled to an allowance of 3 per cent. on their electric cables, and 5 per cent. on their electricity works and plant; but no depreciation would be allowed "under any "circumstances" in respect of any portion of their gas undertaking. It is a matter of importance, and the instructions must not be permitted to get well established before steps are taken to obtain complete recognition of the same concessions that have been granted to the electrical industry. In the case of that industry the negotiations were protracted before Somerset House, and the representative electrical organizations arrived at a mutual agreement as to an allowance basis. But there was success in the end. This is an encouragement to the gas industry to take up the matter, and that at once.

The Gas Industry and Chemistry.

No industry outside chemical manufacture has been governed so much by chemistry as the gas industry; and the latter has long since recognized its value in directing and carrying its operations, and the applications of its products, to the highest degree of perfection. This recognition is growing. Most gas-works of standing have their own chemical department nowadays, presided over by a chemist who has specialized in the work of the gas industry; and, as a matter of fact, the affairs of an important gas undertaking could not very well be conducted without the services of such an official when its staple product is qualitatively assayed by chemical means for penalty purposes under the Acts of Parliament, and while material purchases and sales of bye-products are made on determinations that are purely chemical. Further, the close identity of the gas industry with the Chair of Gas Engineering and Fuel at the Leeds University is another proof of the recognition by the industry of the value of chemistry in perfecting its methods and results.

With such facts before us as to the practical recognition —a recognition, indeed, that is necessary to the point of

ɔmpulsion—by the gas industry of the value of chemistry, ɩere must be protest against the insinuation of Professor rmstrong, in his Presidential Address to the Chemistry ection of the British Association, that there has been failure ı the part of the gas industry to appreciate the value of the ıemist, and that, owing to this, the industry on its chemical de has fallen, year after year, to a lower state. Quite the ›verse is actually the case. Professor Armstrong ascribes ıe fancied fall of the gas industry to the dominant position :cupied in it by the engineer, and to the engineer doing is utmost to exclude the chemist, apparently fearing his ɔmpetition. Such absurdity and pretension to knowledge vhich is not in accord with truth) coming from the lips of 'rofessor Armstrong is astonishing, and quite unpardon-ble when publicly uttered. That our words are not a whit ɔo harsh, in view of the allegations, is shown by the ırther statements to which the Professor gave utterance ı this connection. "The quality of coal gas is such, especially since the withdrawal of the sulphur clauses from the Acts of Parliament by which the industry is regulated, that gas is almost unusable. Had not chemists unconnected with the industry vastly improved the methods of burning it, gas would long since have fallen into disuse." t is unnecessary in the columns of the "JOURNAL" to say nything in refutation of these statements. There has been o change in the quality of coal purchased, other than that rought about by the depreciation of the coal workings ıemselves; and a lower sulphur content in the gas, it is ɔund, is realizable by simple alterations in the methods of arbonization. Professor Armstrong may be advised to get ıto closer contact with the work of the gas industry before gain venturing to allow his tongue to run loose in so base-ɜss an allegation.

'axes on Gas and Electricity.

Some people are of opinion that the Government made a reat mistake when Mr. Lloyd George was elevated to the high ffice of Chancellor of the Exchequer. A correspondent of the Daily Telegraph "—by name R. Ashton—is one of them. In is opinion, he could have framed a much better Budget than Mr. .loyd George has done with the assistance of his colleagues of he Cabinet. There is nothing simpler, R. Ashton thinks, than to onstruct a budget, and to raise money. All that has to be done ɜ to bluff the people by taxing them indirectly. Sixteen million ounds are to be raised by taxing the agents of light, heat, and weetness. His proposal is a tax of 3d. per 1000 cubic feet of gas, f 1d. per unit on electricity, of 3d. per gallon on American and oreign petroleum, of ½d. per lb. on sugar; and, in addition, he uggests the reimposition of the export duty on coal. R. Ashton ɜ generous in letting gas off so lightly in comparison with electriity and petroleum, in view of the largeness of the unit of gas in conrast with the unit of electricity and petroleum. It is sufficient for ıs to talk in this connection of the commodity in which our nterests chiefly lie. No doubt R. Ashton thinks himself original; ɩut his idea we recognize as having been "Made in Germany." Ie calls his heartless finesse an "indirect tax;" it is nothing of he sort. It is, as a matter of fact, a very direct one. Gas could o-day be sold for 2d. to 3d. per 1000 cubic feet less in many ɔlaces if it were not for the rates and taxes fully assessed gasvorks are called upon to bear. This already means an enormous :ontribution to the financial fruits of taxation direct from the ɔockets of multitudes of poor consumers of gas for lighting and :ooking. To deliberately further tax consumers, by making hem pay an additional 3d. per 1000 cubic feet, in the manner ɔroposed by R. Ashton, would be unjust and an act of oppression.

Gas at the White City.

We are pleased to be able to make extended reference in this issue to a nice little demonstration of the utilization of gas for meeting the lighting, heating, and cooking requirements of a small but comfortable residence, which is now being made at the Shepherd's Bush Exhibition. The display, which is one more evidence of the enterprising policy of the Gaslight and Coke Company, had its inception in a suggestion by the Coal Smoke Abatement Society that the Company should join with them in giving a practical illustration of the use of smokeless fuel in a small dwelling. The Company consented; and from last week until the time the exhibition closes, visitors will be provided with an object-lesson which, judging by the interest displayed by those who inspected this part of the Machinery Hall on Saturday afternoon and evening (of which we speak from personal knowledge), should be useful in furthering the interests of gas. This being so, the addition to the White City is a welcome one; and it is matter for regret that the late date at which the arrangements for it were made prevented the exhibit from being earlier got into working order. As is explained elsewhere, what is to be seen is a bungalow, in which one is tempted to sit and dream of blissful week-ends in the country—" far from the madding crowd," but where the gas is laid on. Insistence on this latter simple stipulation is able to transform what would doubtless under any circumstances be a cosy bijou residence into a dwelling in which there may be at hand the greatest of the latest inventions for adding to the comfort of home-life. In the exhibit, no more gas apparatus is in evidence than could be usefully employed in such a sized building; and only such furniture as would be required is to be seen in the rooms. The result is a thoroughly "realistic" demonstration, on which all those who have been concerned in its preparation deserve to be complimented. The "show" to which attention is now drawn does not, of course, constitute the only example of gas lighting in the exhibition. The Keith high-pressure lamps still effectively illuminate a portion of the grounds; and in taking a stroll round, one notices that a good many of the stalls are also lighted by gas.

The Disastrous Explosion at Geneva.

It is a matter for congratulation that it is not often our painful duty to record the occurrence, in connection with the gas industry, of an accident of the appalling character of that which happened at the municipal gas-works at Geneva on Monday afternoon last week, a brief account of which is given elsewhere. Considering the magnitude of the industry, and the nature of its staple product, the extent of the personal injury and loss of life attendant upon it cannot, we think, be regarded as abnormal. Regrettable accidents unhappily occur, not always as the result of carelessness, in carrying on most operations on a large scale connected with the production of commodities or the conveyance of people from place to place. A defective safety lamp brings about a colliery explosion; ineffectually-closed points on a railway lead to the wrecking of a train; and a flaw in a rod in the reversing gear of a winding-engine sends an empty cage crashing down a mine shaft on to another freighted with human beings. A small defect in each instance; but how potent for mischief! In the Geneva case, a large volume of gas escaped—whether in the changing of a purifier or in the process of laying a main it is impossible to say from the accounts to hand—and was ignited, it may have been by a spark from a tool or by some naked light; but on this point there is no definite information. There will doubtless be a searching inquiry as to the cause of the explosion; but, unfortunately, those who would have been able to give the most useful evidence in regard to it have been laid in their last resting-place. If it was not brought about by any negligence on their part, they are, as too many others have been, innocent victims; but if it was, they have paid the penalty with their lives. Their punishment, however, does not alleviate the sorrow and suffering they have caused to others. This terrible disaster serves to emphasize once more the necessity for the exercise of the strictest supervision over workmen, when they are engaged in operations on the portions of gas-works plant from which gas is likely to be liberated; for it is acknowledged that familiarity with danger begets contempt for it. It is to be hoped that something may come to light which will make clear the cause of the catastrophe, and furnish information that will be calculated to prevent an accident of a similar nature elsewhere. Meanwhile, we tender to the Municipality of Geneva, and especially to their Gas Engineer, M. Des Gouttes, our sincere sympathy with them in the calamity which has overtaken them. This feeling, we are sure, is shared by all who have the control of gas-works.

Daylight Saving Bill Dead.

The fate of the Daylight Saving Bill has been sealed again for this session. Inquiry, session after session, has shown that there would be certain advantages to the community by the advancing of the hands of the clock in the summer time; but the difficulty appears to be to make the change without affecting various important interests. The Committee to whom the Bil

was referred this session have heard further evidence, and have also considered the mass of testimony laid before the Committee who sat last year to consider the same question. While appreciating the efforts of the prime mover in the matter (Mr. W. Willett), the Committee's view is that—having regard to the great diversity of opinion existing upon the proposals of the Bill, and to the grave doubts which have been expressed as to whether the objects of the measure can be attained by legislation without giving rise (in cases involving important interests) to serious inconvenience—the Bill should not be proceeded with. Had they recommended otherwise, the Government would not have had time to devote to the passing of the Bill through the final stages this session; and the measure would have gone to the wall without a doubt. As it is, all that can be done—and it is quite sufficient—is for employers who want to make a change in accordance with the proposals of the originator of the scheme to arrange to commence the hours of work earlier in the summer, and thus advance the hours of leaving off. That is not the same thing as a universal obligation; but the beauty of it is that no statutory authority is needed to do it. Though the Bill is dead, there appears to be no general mourning at its loss; and so the feeling of indifference that has existed since the proposal was first introduced to an amused country is continued. The vendors of the means of artificial illumination are among those who will not regret the happy despatch of the Bill.

The Trades Union Congress Agenda.

The Trades Union Congress for this year—the forty-second of the series—will take place next week at Ipswich; and the *agenda* for the meeting has just been issued. Judging from the length of it, the six days over which the meeting is to extend should prove none too long a time in which to get through the business. There are over a hundred resolutions to be submitted for discussion; and these, as usual, cover a very wide range indeed. Among the more interesting of them, is one (referring to unemployment) which demands the immediate institution of work of public utility, and declares that no system of labour exchanges or compulsory State insurance will be accepted unless the Trade Unions of the country have a share in the management, and they are of a non-contributory character. This is sent in by the Gas Workers' and General Labourers' Union. In another direction, an insurance scheme of a non-contributory character does not find favour; and one resolution is to the effect that labour exchanges will not tend in the slightest degree to provide more employment, and that the proposed insurance is a tacit recognition of the evil, that it means the retention of a reserve army of unemployed labour for the use of the employing class, that it cannot be operative in the case of casual workers, and, moreover, that it will result in still fewer workers being employed in order to reduce to a minimum the insurance paid by the employers. Then there are several resolutions designed to prevent labour exchanges being used in case of trade disputes. The London Glass Blowers' Union express the view that the State insurance scheme will reduce the worker to a "position of servile semi-starvation." Charges of sweating and underselling will be brought against the Salvation Army in connection with the operation of a certain factory of theirs; and there is a proposal to condemn the practice of international importation and exportation of workmen to act as blacklegs during trade disputes. Of course, no Trade Union Congress would be complete without a motion in favour of the enforcement of a universal eight-hour working day.

Some Miscellaneous Resolutions.

The matters named above would alone serve to open up a very fair number of industrial questions; but they by no means fully indicate the probable scope of the discussions. The advisability of instituting compulsory arbitration for the settlement of trade disputes is a very proper question for consideration for an industrial congress; but some of the other matters set down are perhaps hardly so likely to meet with adequate treatment at the hands of the delegates. There are, for instance, numerous resolutions dealing with education; and one which is worth special reference wishes an emphatic protest to be entered against the attempt of certain employers to compel employees to join the territorial forces, and views this latest military measure as "an unscrupulous and sinister attempt to introduce compulsory military service in its most invidious form; the compulsion falling upon the most economically dependent class—namely, upon the workers—leaving the aristocracy free from such service, except to direct and officer the forces in the interests of the propertied classes." It further desires the conference to place on record that it is absolutely inconsistent with the policy of Trade Unionists for them to enlist in this force, as they are thereby liable to be called out in times of industrial disputes to quell, and possibly shoot down, their fellow-workers who are struggling to better their conditions. At least one motion is in terms of gratitude; for the Miners' Federation wish to thank the Government and all parties in the House of Commons for the Old-Age Pensions Act. Even they, however, are not satisfied, inasmuch as they press for the reduction of the pension age to 60 years, and the abolition of the disqualifications in the present Act. Many political matters will be introduced by the Parliamentary Committee.

Eight-Hours Act in Operation.

Those who have been looking with some interest to the first results of the working of the new Miners' Eight-Hours Act, will note the report of the Chairman of the Cardiff Chamber of Commerce, who states that the trade returns for the month of July are "disappointing and disconcerting." The figures for Cardiff show a decrease in coal exports, as compared with July of last year, of 126,865 tons; while the Bristol Channel ports are down to the extent of nearly 500,000 tons. This is attributed to the stoppages and disputes which have arisen over the introduction of the Eight Hours Act; and the Chairman remarks that the predictions of the miners' leaders that the Act would not reduce the output, have been so far falsified. In his own mind, he has no doubt that the Act will result in a permanent reduction of the output. It may be that the Chairman of the Cardiff Chamber of Commerce is, in this expression of opinion, referring only to the South Wales coalfield; but, at any rate, what he says tends to confirm predictions which were made in many quarters before the Act was passed as to what its effect on the output would be. There is also, according to the Cardiff correspondent of the "Financial Times," reason for believing that a large section of the miners are disappointed with the Act, inasmuch as it has limited their earning powers. The day men are satisfied, simply because they are employed on a day wage; but the hewers, who are paid according to the amount of coal cut, are in numerous cases dissatisfied. These factors are, it is said, exercising an awkward influence on the market, and are making business of any importance for delivery over periods ahead very difficult to bring to a conclusion, as colliery owners, fully alive to the risks they are taking, justifiably demand comparatively high figures. The clause in the Act permitting the working of an additional hour on sixty days in the year has already been a subject for magisterial decision. The South Wales owners called on the men to work this additional hour; but the Miners' Federation decided that the whole of their members should refuse to work beyond the eight hours legalized by the Act. The South Wales members therefore declined to work the additional hour; and as a result the owners brought a test-case before the Rhondda Stipendiary Magistrate, to ascertain whether they could compel the men to work. This case was decided against the men; and the South Wales Federation thereupon decided to lay the facts before the Executive of the National Federation, for them to settle what further action should be taken in the matter. The men are so firmly convinced that the sixty-hours clause is an entirely optional one, that there is no doubt the decision will be appealed against and the case fought by the Federation, if necessary, right up to the House of Lords. The brief operation of the Act has, therefore, already resulted in a falling-off in the South Wales output of coal, and in the bringing about of what will in all probability prove to be long and costly litigation.

Gas-Engine Reliability.—Writing on this subject in "Cassier's Magazine" for September, Mr. Percy R. Allen says: "Whether the large gas-engines can be safely relied upon to work continuously depends chiefly upon whether they are purchased from experienced manufacturers in the first instance and whether they are installed and supervised by intelligent and unprejudiced men afterwards. Practical experience has demonstrated that a large power plant can be worked with the same immunity from breakdowns as a steam plant, and at about one-half the operating costs. Numerous log sheets of actual runs are available which show that large gas-engines can be run practically continuously."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 591.)

BUSINESS on the Stock Exchange last week was of the usual seasonable dimensions; and, it being account week, fresh business was especially quiet. The movements were irregular. The leading markets were almost devoid of all feature; but in the more speculative lines there was considerable agitation, and in the American there was a material fall in prices. On the opening day, things moved in a mixed way. The gilt-edged group were dull; Consols lost a fraction; but Railways were more cheerful. In the Foreign Market, there was a fair demand. Americans were very sensitive. On Tuesday, a firmer tone was perceptible in many lines, but again the gilt-edged division took the other road. Railways were firm; and the Foreign Market bright and active. This attitude was fairly well maintained on Wednesday; but Railways were rather inclined to yield. Commotion in Americans was the chief characteristic of Thursday; and the rest were mostly quiet and unmoved. Friday was very quiet. Things all round were dull, and mostly with lower prices; Americans being still much perturbed. Saturday was, of course, inactive, and the position of the previous day underwent hardly any change. In the Money Market, there was no new feature. The supply was plentiful, and the Stock Exchange demand made no impression at all on rates. Discount eased down before the close. Business in the Gas Market was very fair considering the holiday season; and the general tendency was capital—showing the well-sustained popularity of gas securities as an investment. A large number of quotations advanced; and others would be bound to advance at the first inquiry. The only adverse movement was special—viz., a sharp set-back in Sheffields. In Gaslight and Coke issues, the ordinary was moderately active, and steady at the old figures of 104 to $104\frac{3}{4}$. The secured issues were hardly touched; a bargain or two in the maximum at from 88 to $88\frac{1}{2}$; and one in the preference at 105. South Metropolitan was quiet and unchanged at from 119 to 120; and the debenture made $85\frac{1}{2}$. Commercials were not dealt in. Among the Suburban and Provincial Group, Alliance and Dublin old marked $17\frac{7}{8}$, ditto new $12\frac{7}{8}$, Bromley C $108\frac{3}{4}$ and $109\frac{3}{4}$, Ilford A 143, while several others advanced without business being done. The Continental companies were quiet and unchanged. Imperial was done at $179\frac{1}{4}$ to $179\frac{3}{4}$, ditto debenture at 96 and $96\frac{1}{4}$, Union at 96 and $96\frac{3}{4}$, and European fully-paid at $24\frac{5}{8}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at $13\frac{3}{4}$ and $13\frac{7}{8}$, Cape Town at 4 free, ditto debenture at $82\frac{1}{2}$ and 83, Melbourne $4\frac{1}{2}$ per cent. at $103\frac{3}{4}$, Primitiva at 7 and $7\frac{1}{16}$, River Plate at from $16\frac{3}{4}$ to $16\frac{15}{16}$, and San Paulo at $14\frac{5}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Discontent in the Electrical Manufacturing Industry—Causes and Effects—A Power Company's Prospects—The Central Station and Power Business—The End of the Gas Industry—Wanted, a School of Electric Cookery, and an Explanation.

THERE has been a plethora of matters to comment upon recently in connection with electricity supply; and it has been impossible to overtake all the subjects of passing interest. There is one, the position of the electrical manufacturing industry, on which, several weeks ago, a few remarks were made. Since then Messrs. Crompton and Co. and the General Electric Company, Limited, have held their meetings. The speeches of Mr. J. Trotter at the former and of Mr. G. Byng at the latter contained throughout a vein of discontent with the conditions under which electrical manufacturers have to work. In the case of the Crompton Company, no dividend has been declared; and in that of the General Electric Company (who have many irons in the fire in connection with electrical appliances) a dividend of 5 per cent. has been paid. Crompton's gross profits, in fact, were reduced by £23,000; and the net profit was only £10,000, in place of £31,000. There is no feeling of exultation on our part over the position in which the electrical manufacturers find themselves; but, in a measure, their position is merely an indication of the degree of prosperity (or whatever is the correct term for the position) in the electricity supply industry. General trade depression is given high place in the causes that contribute to the continuance of the cloud that hangs steadfastly over the manufacturing industry, though that cloud had got well set before general trade fell to the low ebb of immediate past years. The Government, too, is abused for keeping an open door, which allows electrical plant and appliances to come into this country with brazen freedom, while the electrical manufacturers of the country cannot gain an entrance into other countries without paying substantially for the privilege. The growth in national expenditure of an unproductive order is regarded as another contributory cause; and to this expenditure manufacturers have to pay their share. But the main cause is no doubt the mad rush of local authorities for things electrical several years ago, and the slump that has supervened in their demands, owing to prognostications of years ago not having been fulfilled, except in comparatively few cases. Now surmounting the unenviable position of numerous electricity supply concerns, is the consumption-reducing metallic filament lamp, which has again deferred the demand for extensions. The rush of years ago brought into being a large number of firms, to sustain which in a state of fair success, the demands of the electrical industry would have had to be maintained at high-water mark—a condition which it was inevitable could not be fulfilled. The result is an unhealthy competition that is good for no one engaged in the manufacturing industry.

To keep their shop doors open, the manufacturers are extending the field of their operations. Cromptons, for instance, are giving attention to the manufacture of non-electrical appliances which their machinery and tools are capable of turning out. No one can blame them. Not many weeks since, we were describing a fast-boiling kettle for gas-stoves which is being produced in an electrical factory. If the electrical industry cannot find employment for works machinery and tools that have been specially laid down for the production of electrical plant and appliances, the broadening of the basis of the operations of the factories is the only hope of salvation. The General Electric Company deal chiefly in appliances for the utilization of electricity; and they have taken up at appropriate times several really excellent lines. Notwithstanding this, in certain of the seven factories of the Company, there have had to be a reduction of hands and a shortening of hours. But enough of the troubles of the manufacturers. The General Electric Company are the makers in this country of carbons for electric arc lamps, and of Osram metallic filament lamps. Gas-works are drawn upon for the carbon used for the former; and the Company's factory is the only one in England at which flame arc carbons are made. It is interesting to learn that the enterprise has succeeded well, and that in this direction the Company can compete with Continental firms. The sale of Osram lamps, it is reported, has been large; but the Company must be feeling increasingly the pressure of competition, which has brought prices down with such a run, although the lamps are expensive to make. Mr. Byng is quite justified in saying that "no invention since the advent of electric lighting has produced an equal effect." One of the effects has been the disorganization somewhat of the electricity supply industry; and all central station engineers are not prepared, in their present circumstances, to endorse the optimistic assertion of Mr. Byng that, in the result, the lamp will be one of the greatest benefits to the whole industry. However, it is a point of technical interest to learn that the factory at Hammersmith (at which these lamps are made) is completed, and is turning out lamps equal in quality in every respect to those produced on the Continent. Soon the Company will be employing over 1000 hands in this department; and in it Englishmen have learned as quickly how to make efficient lamps as their foreign competitors. It is a change to hear that there are things in which Englishmen can do as well as, if not excel, their German cousins.

Just recently it was announced that the Directors of the Power Company operating in the Newcastle-on-Tyne district had felt it incumbent upon them to pass the interim dividend. The Directors of the Lancashire Power Company, with which is affiliated the Lancashire Power Construction Company, have not felt it incumbent upon them to make a similar announcement, as, if memory is not fickle, they have never had the funds with which to recommend a dividend. No profit distribution with them has been a normal condition. But there was an air of cheerfulness, and symptoms of rising hopes, in the last report and at the recent meeting —at the Directors' end of the room. There has been a reorganization of the Company's affairs; and big results are anticipated. The Board of Trade, too, have given their assent to the transfer to the Company of a number of Electric Lighting Orders from local authorities. But we have never known local authorities who are willing to part with their Orders, if they can detect, or fancy they can detect, a ray of hope of making something out of the business on their own account. To have to part, is to swallow a bitter pill. Such Orders are generally "small fry," and are only abandoned by the holders because there is nothing worth having in them. Then, again, the Directors are in a fever of excitement because the Local Government Board have counselled the Radcliffe authority to take a supply of electricity from the Company in preference to putting down a generating station of their own. Another matter over which the Board extend their congratulations to a longing proprietary is that at June 30 custom amounting to approximately 6590-horse power had been connected with the cables; and an additional 1160-horse power had been arranged for. But the power business does not appear to be very profitable. In the speech at the meeting, it was stated that the output had increased by something like 30 per cent.; but the revenue increase was only £1500. At this rate of financial progress, the shareholders must not pitch their hopes too high. Originally, it was anticipated that the cotton-mill owners would receive the Company with open arms. They have not done so. On the other hand, collieries have been the ones to clasp the Company. But as yet no dividend. The weary shareholders will be glad to see the fruits of these developments before they enter largely and heartily into the cheerfulness of the Directors. From the investment point of view, Power Companies have proved, generally speaking, poor and disheartening enterprises.

The changed aspect of the affairs of the West Ham electricity undertaking—believed by those who look on the bright side of the picture to be entirely due to the expansion of the power business, while others who critically examine the accounts are of opinion that a no inconsiderable part of the apparent improvement is due to temporary curtailment of expenditure in certain items of the revenue account—has induced "The Electrician"

to once again urge upon central station engineers the importance of cultivating a large motor load. Of course, it is all very well to keep rubbing-in this advice; the industry cannot be in the "pink of condition" to need it. However that may be, the districts in which large motor loads are available are few and far between. And, moreover, a study of the accounts of many municipal authorities does not convince us there is much profit in some of the newly acquired motor loads at the price at which they are booked or hooked. Coal has been cheaper; and several of the other expenses on revenue account have not been increased by taking on day motor loads to an extent that does not necessitate additional generating plant. Nevertheless, the final net surpluses in the accounts have not been beneficially affected. West Ham is not the only direction in which to look for effects; and too much may be made of the account outcome of the past year's working without taking into consideration all the details. Our contemporary, in its reference to this matter, states that "the check experienced by most central stations in the sale of electrical energy for lighting purposes, due chiefly—but not entirely—to the adoption of metal filament lamps, has emphasized the advantages of a large power load." We wonder what was in the mind of the writer when he wrote the words "but not entirely." May we suggest as causes first coming to mind that are covered by the qualifying phrase, inverted incandescent gas-burners, the increasing economy of gas lighting, the failures of electricity supply, the consequent annoyance caused to those who have put their trust in electricity supply, and the shocks caused not by contact with electrical wires, but by quarterly electricity accounts. Those who are generous will try to trace in these words the evidence of hope resting on a firm foundation: "There is, of course, some compensation in the fact that the advent of improved lamps is always likely to be accompanied by an influx of new consumers, until the time arrives when electric light will have become the customary illuminant." But what about the influx caused by the improved lamps of the gas industry?

While on this point, an article in the "Industrial Supplement" of the same paper read in conjunction with the above statement lead us to wonder whether an uncanny omniscience, or something else, is possessed by the editorial staff of our contemporary. Electric lighting, we have just seen, is to become the universal illuminant; and now the writer of the editorial notes in the "Industrial Supplement," to give contradiction to our recent charge of a wavering between pessimism and optimism on his part, says that the day is not far distant when the use of gas-cookers will be near vanishing-point. There is no error in our reading. "We are confident," says this prophet of evil, "that the time is shortly coming when electricity will be a much more serious competitor in domestic heating and cooking, and that, though there may be now 600,000 gas-cookers in use in the London area, the time when they will be much less numerous and *even near to vanishing-point, is not so far off as some people seem to think.*" We will not say all the things that might be said about this. But just previously the same writer admits his knowledge of the existence of a proverb "relating to the volume of sound emanating from empty vessels." He thinks perhaps the statement may apply to "gasometers." It may also apply to other things and persons—self-constituted prophets, for example. One word in the private ear of our prophetic friend, as his engineering knowledge is a little at fault. The vessels that (say) a century ago performed the dual function of measuring and holding gas are not in use now. Gasholders and gas-meters are structures of extensive current use; but "gasometers" have been left far behind in history. But let us pause to contemplate the bigness of the scrap heap those holders and meters are going to make in the very near future! The gentleman blessed with the gift of foresight might add to the interest as well as the amusement of his readers by stating the probable dimensions of the scrap-heap.

Heating and cooking is a branch of business that central station engineers are, in addition to power, freely bidden to cultivate, selling current at 1d. per unit for the purpose, in order to help to make up for lost units due to the metallic filament lamp. The loss is a big one; and requires some making up. Success in this direction does not come by leaps and bounds. "Start cookery schools" is the advice tendered by the writer of "Installation Topics in the Electrical Times." We agree with him as to the necessity of such schools for electrical cooking; and there ought to be a subsequent course in an electrical school of engineering, so that the housewife or the cook may know how to properly manage an electric cooking-stove, and to do any small repairs requiring prompt attention when things do not go right, and there is danger of the dinner being spoilt. We do not admit that there is much difficulty in learning how to use a gas-cooker. There are hundreds of thousands in London alone. But there have not been a similar number of housewives in London who have attended cookery schools. The writer in our contemporary is candid. "It is useless," he says, "to describe the merits of an [electric] oven in the showroom; and it is as nearly as useless, and it is expensive, to iustal one on trial." We do not follow our friend, as a little later it is found that he holds by the belief that it is possible to soon realize the superiority of electric cooking over any other system. If it is possible to so soon do this in a cookery school, it cannot be a matter of great difficulty to realize it under other circumstances. To fix such an apparatus with such superior merits, and to send a qualified instructress to the house, ought to ensure its continuance in place and use. Another remark of our friend is that "the price paid for current, although an important factor, is seldom the determining one; and, at 1½d. or less per unit, electric cooking in 'intelligent hands' will compare favourably with gas at 2s. 6d." With confidence, it is suggested to the writer that this is empty assertion. Take 14-candle gas as being equal to 500 B.Th.U. per cubic foot, 1000 cubic feet will be equal to 500,000 B.Th.U. The 2s. 6d. would purchase 20 units of electricity at 1½d.; and the 20 units will be equal to less than 70,000 B.Th.U. Will the writer of "Installation Topics" kindly favour us by stating the grounds for his assertion; and also say what he thinks becomes of the difference of upwards of 430,000 B.Th.U. that are in the 1000 cubic feet of gas as compared with the 20 units of electricity? If not instructed, we might be amused; so that he would have the gratification and the happiness of knowing that his labour has not been entirely lost.

PERSONAL.

Mr. James Diggle, of Heywood, who is at present superintending the construction of sewage works at Bury, has been appointed Borough Surveyor and Water-Works Engineer to the Hyde Corporation.

Mr. George P. Lawton, chief clerk at the Burslem Gas-Works, was on Monday last week presented with a handsome clock, by the officials and workmen of the Gas Department, on the occasion of his marriage. The presentation was made by Mr. Edward Jones, the Engineer and Manager, who spoke of Mr. Lawton in felicitous terms, and wished for him and his wife long life and much happiness. Mr. Lawton feelingly expressed his thanks to the subscribers.

OBITUARY.

JOSIAH CHANDLER.

We regret to record the death of Mr. Josiah Chandler, which took place last Wednesday, at his residence, Brixton Hill, S.W. Some time ago, Mr. Chandler had to undergo a serious operation, which was successfully performed. But he never thoroughly regained his former strength; and about five weeks ago he was confined to his room by illness to which he succumbed.

Mr. Chandler will be remembered by a large number of gas engineers in association with his brother, Mr. Samuel Chandler, who are so well known in connection with washer-scrubbers. It is now some thirty-five years since the late Mr. S. Chandler, in conjunction with the late Mr. D. Hulett, patented a horizontal revolving washer, which was worked at the Bromley-by-Bow station of the old Imperial Gas Company. This, however, did not produce results such as were needed in apparatus of this kind. Still, it was the forerunner of the more efficient washer produced later by Messrs. Kirkham, Hulett, and Chandler, Limited. Shortly afterwards, the subject of this notice and his brother Samuel joined their father and Mr. Hulett in patenting improved gas-washing apparatus; and at this juncture success was achieved, and a large business followed in England and many other countries. Since the demise of Mr. Josiah Chandler, there remains only one of the founders of Messrs. Kirkham, Hulett, and Chandler, Limited—viz., Mr. S. Chandler; Messrs. D. Hulett, T. N. Kirkham, and S. Chandler the elder having also passed away. We sympathize with the last surviving member of this well-known firm as well as with the family of the one just removed, in the loss they have sustained.

The First London Square Lighted with Gas.—Finsbury Square, according to a correspondent of the "Westminster Gazette," was the first public place lighted with gas, though some experimental lamps had previously been displayed in front of Carlton House.

Electric Light Troubles.—In a report in the "Daily Telegraph" as to the destructive fire in Cannou Street last week, among the troubles encountered by the firemen were the electric light wires. At all events, that is what we gather from the remark that "the electric wires constituted a constant menace."

The Commercial Production of Hydrogen.—It is reported in a recent number of the "Zeitschrift für Beleuchtungswesen" that a Company has been formed, with a capital of £62,500, for the exploitation of a process for the manufacture of hydrogen of a high degree of purity. Among the founders of the Company are the Dellwik-Fleischer Water-Gas Company, of Frankfort-on-the-Main; and the process which the new Company will work is known as the "Dellwik-Fleischer Hydrogen Process." The gas made by it is said to contain about 99 per cent. of hydrogen; and the process is stated to be of a very simple nature, and to entail very small working charges. The apparatus has already been employed by the Prussian military authorities for the manufacture of hydrogen for charging balloons. The name of the new Company is the International Hydrogen Company (Internationale Wasserstoff-Akt.-Ges.); and the Board of Directors includes, in addition to representatives of German banks and financial institutions, Herr R. Blum, Manager of the Berlin-Anhalt Engineering Company, and Fräulein Agnes Fleischer, of Wiesbaden.

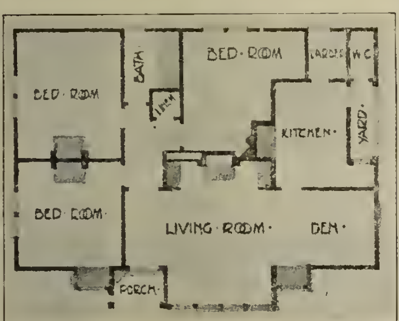
GAS EXHIBIT AT THE WHITE CITY.

An Attractive Bungalow.

THE project which we were able to announce some weeks ago ıad been formed by the Gaslight and Coke Company to secure a small representative display of the domestic uses of gas in conıection with the Imperial International Exhibition which is being ıeld at the White City, Shepherd's Bush, is now an accomplished 'act; and those who have been concerned with the carrying into effect of the idea, may fairly be congratulated upon the result. For the guidance of intending visitors, it should be pointed out hat the exhibit is to be found in the Coal Smoke Abatement Section of the Machinery Hall. As previously explained by the General Manager of the Gaslight and Coke Company (Mr. D. Milne Watson), about the end of April the Company were approached by the Coal Smoke Abatement Society with a request hat they should join with them in providing an illustration of how cottage or bungalow can be smokelessly heated and lighted; and the Company agreed to the suggestion.

A country bungalow, covering a space of some 1100 square feet, ıas been erected by the Alnwick Foundry and Engineering Company, and suitably furnished throughout by Messrs. Oetzmann and Co.; and the portion of the task undertaken by the Gaslight and Coke Company has been the fitting-up of the various rooms with specimens of modern gas appliances for lighting, heating, and cooking. This work has been carried out under the supervision of Mr. E. Pilbrow, the Inspector-in-Charge at Kensington and Harwood Terrace; and there have been fixed throughout just uch fittings as would be most suitable for use in a building of the character and size of that shown. Altogether the impression given to the visitors is that they are inspecting a bungalow furnished and fitted on really practical work-a-day lines—which is quite correct; and they therefore find themselves fully prepared to consider the advantages of all that they see there in relation to their own homes. The installation was only completed about the middle of last week; but it has already proved itself a most attractive exhibit. On Saturday afternoon and evening, for instance, the number of visitors who passed through the bungalow must have averaged several hundreds an hour. There is no undue amount of advertising outside the building; all that appears being the simple announcement: "Lighting of this bungalow and installation of apparatus for heating and cooking by smokeless fuel carried out by the Gaslight and Coke Company, Horseferry Road, S.W."

In attempting a description of the exhibit, it is necessary to take it as a whole, instead of confining attention solely to the gas portion; and reference may first be made to the bungalow itself, the chief points of which were indicated to a representative of the "JOURNAL" by the architect, Mr. M. Andrew Sell. Over the porch are to be seen the words "Ye Hut—The Port of Ease from Travellers' Toil;" and the building by no means belies the latter portion of its name. At the side of the door is an old fashioned iron lantern, which was made and supplied in twenty-four hours by Messrs. Evered and Co., and which is in complete harmony with the general scheme of the building. The burner used in this lantern (as on the other fittings, with the exceptions that will be noted) is the New Inverted Company's latest pattern—the "Nico Medium" burner, No. 6. As will be seen from the accompanying plan, the bungalow consists of three bedrooms, a general living-room (which can, if desired, be divided off into two rooms), bath-room, kitchen, and larder. The special feature is the simplicity of the planning. All the bed-rooms and the bath-room are entered off a single lobby, 6 feet long (thus saving the usual waste of space in passages), and are immediately accessible from the main living-room. This latter is a particularly fine room, 27 feet long, provided with a most tempting old-world ingle-nook, and well-lighted from a 12-foot bay. The open timbered ceiling of the room is most attractive; and altogether it may be said that



Gas-Fitted Bungalow at the White City.

he designer has succeeded in his endeavour to rise above the ıackneyed type of country bungalow. The walls are constructed, both inside and out, with a patent fire-proof and damp-resisting air-tight material, with a 4-inch air-space in between, which acts as a non-conductor of heat or cold. May it be added, for the benefit of readers who are on the look-out for a cosy week-end residence, that the cost of such a bungalow as here described and illustrated is £300, erected in England?

Stepping into the living-room from the front entrance, the furniture is seen to be in dark oak. The lighting is by means of six wall-brackets and a large centre pendant—all in wrought iron and copper. The wall-brackets throughout are by Messrs. Kempton and Sons, and the pendants by Messrs. Evered and Co. and Messrs. Benson and Co. The brackets are in all cases fitted with "Nico Medium" burners; and the centre lights with large size "Nico" burners. Two of the wall-brackets are in the ingle-nook. The fire is an Edgar "Blenheim," fitted in a dog grate, in a blue tiled recess. Mention must be made of the handsome shades with which the lights in the various rooms are provided, and which have been supplied by Messrs. Ellis, Simpson, and Saunders. Throughout, the burners are operated by the pneumatic switch, fitted with either tumbler or pull-and-push movement; and in the living-room there are two models to show the working of the system in connection with upright and inverted mantles respectively. These are of assistance in explaining to visitors how easily the principle of switching on and off can be applied to gas lighting.

In the first bed-room, all the furniture is white enamelled, and is in the Adam style. The fire is a Main "Malvern" nursery pattern. The second bed-room is furnished in mahogany; the fire being a Wilson and Mathieson "Sheraton." In both these rooms, the pneumatic switches connected with brackets over the head of the twin-beds are arranged so that the lights can be turned up on entering the door and extinguished by means of a flexible switch hanging down at the side of the beds. In each room there is a pendant over the dressing-table, fitted with the large size New Inverted Company's burners. The third bed-room is furnished in oak, and has a Fletcher-Russell "K.N." fire. The lighting is by means of three wall-brackets. In these rooms, again, all the fittings are in wrought-iron and copper.

The bath-room is provided with a Ewart No. 3 geyser (shown in continuous action) for the bath, and a "Gem" lavatory geyser by the same firm, fitted with a shower. Warmth is furnished by a Richmond "Surrey" condensing stove; and in the adjacent corridor there is for the same purpose a Wright "St. Andrew" gas-steam radiator.

The kitchen is supplied with hot and cold water by means of a Wilson and Mathieson circulator or a Davey and Roberts coke-heated boiler. These coke-boilers are now used extensively in the Company's district—particularly in large houses where gas is used entirely for cooking and heating, and where the coke-boiler is in consequence found to be a convenient method of burning up refuse, &c. The cooker is one of the "New Davis" screwless pattern, enamelled steel inside and out, with the hot-plate and oven-door heavily nickelled; and on top is a Serné patent hot-closet, designed for keeping warm plates, &c., by utilizing the waste heat from the oven and hot-plate burners. Under the closet there is a small atmospheric burner which can be lighted when neither the oven nor the hot-plate is in use. The cooker, circulator, and coke-boiler are fitted in a tiled recess, at the side of which is a swing bracket fitted with a flat-flame burner, for the purpose of throwing light on the culinary operations. The general lighting of the kitchen is by means of two No. 2 Kern vertical burners.

This is a demonstration of lighting, heating, and cooking arrangements precisely as one would expect to find them in actual practice in any well-regulated home of the style and size of the White City Bungalow.

FATAL EXPLOSION AT THE GENEVA GAS-WORKS.

We regret to have to record the occurrence, on Monday afternoon of last week, of a disastrous explosion at the municipal gas-works at Geneva, as the result of which thirteen people were killed, a number of others were injured, and considerable damage was done to the works and to the buildings in the neighbourhood. As some of our readers may be aware, the works are situated in the south-west portion of the city, not far from the junction of the Rivers Rhône and Arve. They are practically on the banks of the former river, and are bounded on the south by the Boulevard de St. Georges. They have gradually taken the place of the old works dating from the forties, and in all respects may be regarded as quite up to date. An idea may be formed of their capacity when it is mentioned that in the year ending Dec. 31, 1907, the quantity of coal carbonized was about 31,400 metric tons, which was an increase of 3000 tons on the preceding year; and the make of gas was something like 379 million cubic feet, about $11\frac{1}{2}$ per cent. of which was carburetted water gas. Within the boundary of the works is a building constituting the Swiss branch of the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, of Paris; the business being carried on under the supervision of M. Masset, one of their Engineers. The Municipal Gas Engineer is M. Des Gouttes, who was not on the works at the time of the occurrence.

So far as can be gathered from the somewhat contradictory reports which have reached us, work seems to have been going on much as usual, when shortly after four o'clock the whole neighbourhood was alarmed by a terrific explosion, followed by a great outburst of flame. The effect on the windows and fronts of the houses in the vicinity can well be imagined. An excited crowd was soon making for the scene; but, thanks to the prompt action of the authorities, the approaches to the gas-works were kept clear. Within the works, the scene was terrible to witness. The purifier-house, which also contained the governors, was in ruins, and a large comparatively new gasholder, capable, according to one report, of containing about $1\frac{3}{4}$ million cubic feet, had been brought down. Through the courtesy of a correspondent, we are able to give our readers an idea of the extent of the damage.

The Geneva Gas-Works after the Explosion.

How the catastrophe was caused has not so far been definitely ascertained; but it appears that a main was being put down at the time, and if, by inadvertence, gas was allowed to escape, its ignition by some neighbouring naked light or by a spark from a tool can be quite easily understood. But whatever the cause, the effects were appalling. We read of workmen being shockingly mutilated, and of portions of bodies being found in an adjacent cemetery. Rescue and first-aid work were promptly commenced; the wounded being subsequently removed to hospitals, and the dead to suitable mortuaries. Among these were M. Georges Béguet, an engineer connected with the works, M. Masset, who has been already referred to, and M. de Parvillée, an engineer from Paris. The last-named gentleman, in company with an English engineer, Mr. Bernard Moore, was on a visit to Geneva. They had arranged to have a trip on the lake on the day of the accident; but M. de Parvillée changed his mind, and visited the gas-works with his friend M. Béguet. It was for him an unfortunate alteration of plans. As in most catastrophes, there were some remarkable escapes.

On the night of the explosion, the consumers of gas were cautioned by the municipal authorities against using gas, except under instructions from the officials of the Gas Department; and the lighting of the streets for several nights had to be done by suspended lanterns. A patrol was also organized to ensure the public safety.

From the highest to the lowest, the greatest sympathy has been expressed for the sufferers by the accident. The State Council addressed a letter of condolence to the Administrative Council, and telegrams couched in similar language were sent by the Municipalities of Lausanne, Vevey, St. Gall, Neufchâtel, and Fribourg. The city was practically in mourning—public amusements and functions being suspended; and subscriptions were opened for the families of the victims.

The funeral took place on Thursday, and was quite an imposing ceremony, being attended by members of the Administrative Council, representatives of the State Council, a large number of the officials, M. Basso, the Consul-General of Italy at Geneva (the majority of the victims being Italians), and M. Des Gouttes. A long procession, consisting of nine hearses and several carriages, accompanied by representatives of various societies and the Italian colony, with their flags tied up with crape, was formed shortly after midday, and started for the cemetery, which was reached by two o'clock. The interment was witnessed by a large concourse of people. Earlier in the day, the body of M. Masset was cremated; and that of M. de Parvillée was sent on Friday to Ville d'Avray, near Paris.

Presentations to Mr. John Bond.

In the "Journal" for the 22nd of June, reference was made to the approaching marriage of Mr. John Bond, the Gas Engineer of the Southport Corporation, to Miss Hankinson, of Alvechurch, Birmingham. It will be solemnized to-morrow; and the prospective happy event afforded the employees of the Gas Department at Eastbank Street an opportunity of showing in a tangible way their high regard and esteem for their chief. It took the form of a presentation, which was made last Thursday evening, on behalf of the subscribers, by Mr. J. E. Blundell, the Superintendent of the Gas Department. Mr. Blundell said that as soon as the subject of a presentation was broached, it received the enthusiastic support of the men, from one end of the department to the other. He was only voicing what each one felt when he asked Mr. Bond to receive the presentation (consisting of a canteen of cutlery) in the spirit in which it was given, and also at the same time to accept from them their best wishes for his future happiness. Mr. Bond was also requested to accept the gift of a tea service from the workmen for the bride-elect. Mr. Bond, acknowledging the gifts, said he would always remember the very great kindness of the employees by the splendid present they had just made to him. It was a hall-mark of their appreciation of himself, and of the great friendship which had ever existed between them. Of course, they would understand that his feelings on this occasion could not be very well expressed in words. He could only thank them, on behalf of his *fiancée* and himself, most sincerely for the excellent gifts which had been made and the kind words spoken. The members of the Gas Committee have also subscribed for a present to Mr. Bond, and a handsome rose bowl has been purchased; and we learn that a further present was to be made on behalf of the Crowlands officials and workmen.

DEZENDORF'S QUICK-TEST AUXILIARY DEVICE FOR GAS-METERS.

Last week reference was made in the editorial columns of the "JOURNAL" to an invention of Mr. R. L. Dezendorf, which was described and illustrated in our "Register of Patents" (p. 515). In view of the interest attaching to the arrangement, we reproduce the views of an American correspondent, who (in the light of his own experiences) has carefully considered the merits of the proposal. His opinions should be prefaced by the statement that no meter is fixed here without being officially tested and sealed; and all meters that will not pass the test within statutory limits, are rejected. Our correspondent writes:

The device is an invention of great importance and value to gas companies. In fact, under present conditions, it is a necessity, if there be a desire to reduce loss to a minimum and the many misunderstandings to which gas-supplying interests are exposed—particularly in the large centres.

The gas-meter, in all other respects perfect and accurate as human ingenuity can make it, has always lacked a very important feature—namely, means for positively and instantly making the tests that a gas company should be very particular to make, in order to protect itself against accident, loss, or complaint.

It is well known to many that the ordinary test-hand on consumers' meters is very unsatisfactory and imperfect for testing either meters or house pipes. Accounts are frequently opened and supplied through meters that do not register all the gas used. Furthermore, leak complaints and accidents have resulted from the unreliable and slow-moving test-hand which, being geared and necessarily subject to lost motion and slow moving, is a source of trouble, especially when tests are made, as must needs be, by the ordinary fitter or district man.

The invention will indicate in thirty seconds what it takes fifteen to thirty minutes to determine in the old way, when testing either the meter or the house-pipes. Therefore it is at once apparent if the meter does not register all the gas consumed; and the meter being found to register properly, the house-pipes can be tested in thirty seconds, instead of fifteen to thirty minutes.

The indicator is designed so that it may be placed where it is readily distinguished; and on a 5-light meter it will show gradations as fine as 1-600th part of a cubic foot. Being operated directly by the crank-shaft without gearing, it instantly shows any movement of the diaphragms, and will, therefore, without waste of time, indicate whether the meter registers correctly—there being no lost motion to take into account, or to cause error. It also makes it possible to determine the actual proof of the meter with the top on, as the revolution of the tangent can be pointed exactly with the revolution of the test-hand—a thing that was not possible until made so by this invention. Meters can also be tested on one, or any number of revolutions with the top on, and will afford a great saving in the testing of meters brought in from the district, and reduce the quantity of gas (or air) that is required for the test.

As the attachment provides a simple and reliable means for testing meters on the district, it will materially reduce the cost of making tests which experience teaches should be undertaken so as to keep meters on the district in reliable condition. Exchanging meters for age or length of service does not really afford proper protection against loss, as the period of accuracy varies according to the location and conditions where meters are set.

As much of the gas used is through one burner at a time, the loss where meters are not kept in good order is, of course, very considerable. Meters will frequently be slow on a consumption of 5 cubic feet per hour, and correct on 20 cubic feet.

The device makes it possible to carry out inspections quickly, economically, and positively, thereby admitting of greater length of service for meters where conditions are favourable, and a shorter period where the conditions are not so good.

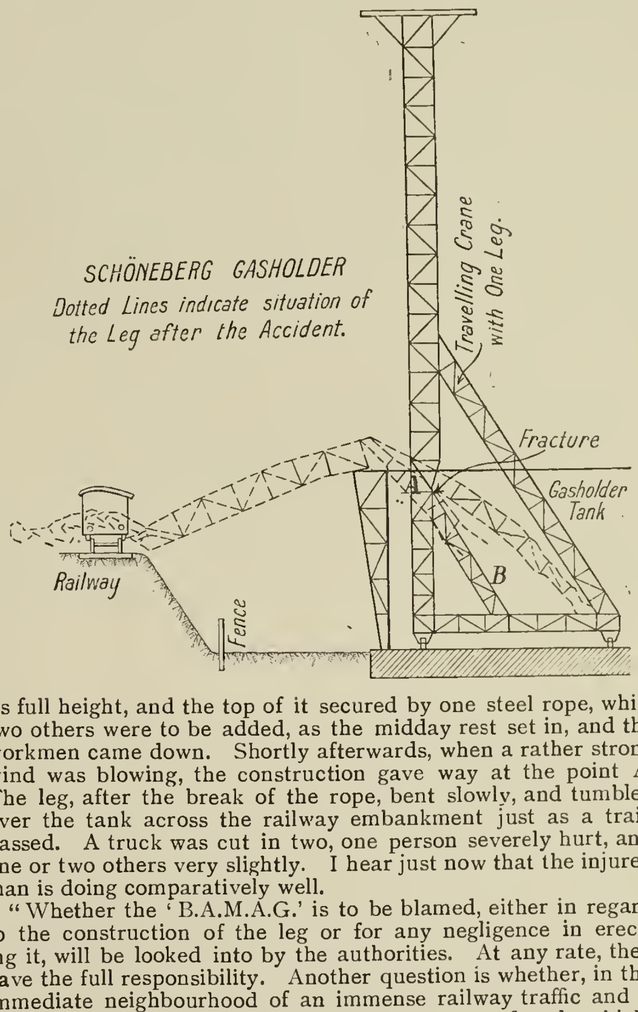
It is extremely important when unlocking and turning on a meter to first be certain that the meter registers properly; and it is very desirable if it does not register to know it positively and at once—a thing difficult with the ordinary test-hand.

Briefly, the advantages of this auxiliary indicator are as follows: 1. Meters can be unlocked and the meter and house-pipes properly tested with a very material saving of time. 2. Dangers from accidents from leaks are reduced by reason of the facility with which even the smallest is determined. 3. Tests on districts can be made when desired at a reduced cost and with accuracy. 4. Losses attributable to supplying gas through slow meters are prevented. 5. Misunderstandings growing out of comparisons caused by slow meters, and the complaints occasioned thereby, are materially reduced. 6. Unnecessary exchanging of meters on the district is prevented; for the facility with which the registration of the meter can be determined enables an examination on the district to be quickly and accurately made. 7. Meters may be tested and the actual test determined, as the revolution of the pointer and the tangent can be brought together, thereby eliminating the old doubt as to proof of a meter with the top on. 8. Meters with tops on can be proved on one or more revolutions of the tangent. 9. Saves expense incident to exchanging and testing and repairing meters reported in error through fault of the geared test-hand, besides materially reducing the cost of doing those things which should be done by a properly operated gas company. 10. Cannot wear out, or get out of order; is easily attached; and will prove of great economic value to gas companies.

THE ACCIDENT AT THE SCHÖNEBERG (BERLIN) GAS-WORKS.

In the last number of the "JOURNAL," brief reference was made to an accident which occurred on the 19th inst. at the Schöneberg Gas-Works of the Imperial Continental Gas Association in Berlin. A large girder crane, used in connection with the erection of a gasholder, gave way, and fell on to a train which was passing over the adjacent railway, cutting a truck in two, and injuring two persons. The tank and holder are being constructed by the Berlin Anhaltische-Maschinenbau-Actien-Gesellschaft. The tank is of steel, 200 feet in diameter and 51 ft. 6 in. deep; and the holder will have four lifts, and a capacity of 5,650,000 cubic feet. Immediately after the accident, Mr. E. Körting sent a telegram to the Secretary of the Association (Mr. R. W. Wilson), apprising him of it; and he subsequently sent a report, accompanied by a rough sketch showing how the girder gave way. These have been forwarded to us by Mr. Wilson; and we reproduce them. Mr. Körting's report is as follows.

"The tank of the new Schöneberg holder had been just finished, and was in preparation for the erection of the guide-framing. A big crane or leg, consisting of lattice work, was being put up, as shown on the accompanying sketch. This crane was movable on circular rails inside the tank; the necessary stability of the base being provided by oblique struts B. The leg was just erected to



its full height, and the top of it secured by one steel rope, while two others were to be added, as the midday rest set in, and the workmen came down. Shortly afterwards, when a rather strong wind was blowing, the construction gave way at the point A. The leg, after the break of the rope, bent slowly, and tumbled over the tank across the railway embankment just as a train passed. A truck was cut in two, one person severely hurt, and one or two others very slightly. I hear just now that the injured man is doing comparatively well.

"Whether the 'B.A.M.A.G.' is to be blamed, either in regard to the construction of the leg or for any negligence in erecting it, will be looked into by the authorities. At any rate, they have the full responsibility. Another question is whether, in the immediate neighbourhood of an immense railway traffic and a gas-works in action, one ought to permit the use of tools which, when going wrong, could do harm beyond the area allotted to the contractors as their field of action. The railway authorities and the Imperial Continental Gas Association, without releasing the 'B.A.M.A.G.' from their responsibility, will therefore have to insist on their adopting an absolute safe method of erection in future. Otherwise we do not incur any loss beyond the unavoidable delay, which, however, in this case, is without consequence."

Concrete Piles.—"The tremendous advance in the price of wood witnessed in recent years intensifies the interest otherwise felt by engineers in the concrete pile," says Mr. J. F. Springer, in "Cassier's Magazine" for September. "Concrete as a fully adequate substitute for wood is confidently recommended and accepted by hard-headed, practical men. Perhaps most engineers conversant with both would say that, upon the whole, concrete piling is to be regarded as decidedly preferable. It is not a necessity that these piles be for ever submerged. If the concrete, however, is to be subjected to the alternately freezing-and-thawing action of water, it must be made waterproof where so exposed. On account of the indifference of the concrete pile to hydraulic conditions, it often has even a first-cost superiority to the wooden one."

LONG DISTANCE BULK TRANSMISSION OF GAS.

A recent number of the "Journal für Gasbeleuchtung" contained a reprint of a communication made by Herr A. Lenze, of the engineering staff of the Düsseldorf Gas and Water Works, to the meeting of the Association of Gas, Electrical, and Water Engineers of the Rhine District and Westphalia, on the "Transmission of Gas through High-Pressure Mains to a Distance." The communication is largely of a theoretical character, and many of the tables given in connection with it cannot be usefully converted into terms of English measures. The following digest of the contents of the paper will, however, show the grounds it covers and the general conclusions at which the author arrives.

Coke-oven works have of late years made great efforts to utilize the gas produced from the ovens, not merely on the works itself, but, in so far as there is a surplus over and above that which can be profitably consumed there, in other directions also. In Westphalia, some towns and gas-works already take a certain amount of gas from the coke-oven works. These works, however, are at a considerable distance from some of the larger towns—such as Düsseldorf—and the question, therefore, naturally arises whether the gas-works of such a town could obtain the gas it requires wholly or partially from coke-works. The question may be advantageously investigated in a purely academical manner, in order to ascertain the relations which would have to be maintained between the diameters of the mains required, the initial gas pressure, and the quantities of gas transmitted. The power required and the cost of transmission may also be investigated. The coke-ovens are at a distance of about 50 kilometres (or, say, 30 miles) from Düsseldorf, and the author has calculated the quantity of gas which would be transmitted by mains of 100 to 500 mm. (say, 4 to 20 inches) internal diameter under absolute initial gas pressures of 15, 20, 35, 60, and 80 metres (49, 66, 115, 197, and 262 feet) head of water. His calculations were made according to a modification of Pole's formula introduced by W. Jäger, of Berlin, which when transposed into terms of English measures becomes approximately as follows:

$$Q = 957\, d^2 \sqrt{\frac{(h_i^2 - h_o^2) \times d}{s \times h_o \times l}}$$

in which

Q = the volume of gas of specific gravity s issuing from the main in cubic feet per hour.
h_i = the absolute initial pressure in inches of water.
h_o = the absolute terminal pressure in inches of water.
d = the diameter of the main in inches.
l = the length of the main in yards.

For calculating the power required to drive the gas through the main, the author takes the following formula for isothermal compression:

$$N = \frac{10{,}000 \times p_1 \times l_n \frac{p_2}{p_1} \times Q}{3600 \times 75 \times \eta}$$

in which

N = the number of horse power.
l_n = the length of the main in metres.
p_1 = the absolute pressure in front of the compressor.
p_2 = the absolute pressure after the compressor.
Q = the quantity of gas in cubic metres at the pressure p_1.
η = the working efficiency (= 0·65).

Using these two formulæ, the author has calculated both the quantities of gas and the power required for the total length of main of 50 kilometres, and also the figures for half that length of main, with a view to ascertaining whether it is advantageous to introduce an intermediate pumping-station halfway along it. From these tabulated figures, it becomes evident that from the economical standpoint no good purpose is served by the introduction of an intermediate pumping-station. For instance, at 8 atmospheres pressure absolute 31,000 cubic feet of gas may be forced per hour through a main 100 mm. (about 4 inches) in diameter and 50 kilometres (54,680 yards) long, and the power required will be 107 H.P. In order, however, to force approximately the same quantity—viz., 32,700 cubic feet—through a main of the same diameter and half the length, 93 H.P. will be required; so that for transmitting this volume of gas through the total length of 50 kilometres of main 186 H.P. would be required if the pumping were done in two stages. Consequently, it appears that the employment of an intermediate station can only be justified if it is desired to avoid the evils of very high-pressure and the considerable rise of temperature which ensues when the pumping is done in one stage. It is not defensible on the ground of economical working pure and simple.

Another table given by the author shows the cost of compression per cubic metre of gas transmitted for absolute initial pressures of 20 metres (65·6 feet) and 80 metres (262·5 feet). As an example of the results shown in this table, it may be mentioned that the annual cost of transmitting gas through a 100 mm. (about 4 inches) main will be either £1532 or £2110, according as the absolute initial pressure is either 65·6 feet or 262·5 feet of water. On the other hand, if the quantity of gas transmitted is taken into account, the cost per 1000 cubic feet amounts to only 1·9d. at 262·5 feet pressure, as compared with 6·3d. at 65·6 feet pressure. These general calculations are interesting as affording an idea of the quantity of gas which can be transmitted for the expenditure of a given power and cost. But the further question as to the diameter of the main which is required for transmitting the particular quantity of gas to a stated distance may next be considered, in conjunction with the problem of the initial pressure or fall of pressure at which the installation can be most advantageously worked. This question has been worked out by the author for a particular case relating to the Düsseldorf Gas-Works.

It is contemplated erecting a gasholder of about 80,000 cubic metres (about 2,800,000 cubic feet) capacity in the district, at a distance of 5 kilometres (5468 yards) from the gas-works, and to work from it by means of governors directly into the distributing system of the town. If the gas stored in this holder is taken as about 70 per cent. of the maximum output per diem, there might be distributed from it about 110,000 cubic metres. Therefore this quantity of gas must be transmitted to it per diem; or, for a 20 hours' working day, there must be transmitted 5500 cubic metres (about 194,000 cubic feet) of gas per hour. The power for, and cost of, transmission has been calculated for all standard sizes of mains from 200 mm. (8 inches) to 700 mm. (28 inches), both for gas-engine and for electro-motor power. Steam power is here excluded for local reasons. The cost of gas for power is taken at 1s. 1·6d. per 1000 cubic feet, and the cost of current at 0·72d. per unit. The efficiency of the blower has been taken at from 50 per cent. for small to 65 per cent. for large sizes. Interest on the capital outlay has been reckoned at 4 per cent.; amortization at 1 per cent.; depreciation on buildings at 3 per cent.; on mains at 4 per cent.; and on the machinery at 10 per cent. The specific gravity of the gas, which contains some amount of water gas, has been taken at 0·44. The fall of pressure up to 1000 mm. of water (39·3 inches) has been taken according to Pole and for higher falls according to Jäger. The fall of pressure naturally increases as the main becomes narrower, slightly at first, but very greatly as the smaller diameters are reached. For instance, the fall of pressure, starting with 3 inches for a 28-inch main, becomes 6·4 inches for a 24-inch main, and rises to 800 inches for an 8-inch main. The power required naturally follows the same course. For instance, for the 28-inch main it is only 3½ H.P., but rises for a 12-inch main to 115 H.P., and for an 8-inch main to 355 H.P.

In calculating the power required, it is clear that at low pressures the work of compression is relatively small, and the total work can, therefore, be taken as equal to the work of transmission according to the formula:

$$N = \frac{Q \times H}{3600 \times 75 \times \eta}.$$

On the other hand, at high pressures the work of transmission is relatively low, and only the work of isothermal compression, calculated according to the formula already given, comes into account. These two methods of computing the work come together at between 1000 and 2000 mm. (39·3 and 78·6 inches) positive pressure. An endeavour has been made to ascertain the most favourable conditions in respect of the diameter of the main, and of the working power required for an installation, by calculating the figures for different sizes of main on the basis of figures for the cost of gas and current and capital charges already stated. With large mains the cost of pumping the gas is naturally low, but the capital charges are high. With small mains, where the power required for pumping is relatively high, electricity is costly compared with gas as a source of power. Taking both running cost and capital charges into account, it is found that for a main of 5 kilometres (5468 yards) in length delivering 5500 cubic metres (194,000 cubic feet) of gas per hour, the most economical size of main is about 500 mm., or (say) 20 inches diameter. With this size of main the electro-motor is cheaper than the gas-engine, because the power is not required at all during the spring, summer, and autumn, as the gasholder under consideration can then be bye-passed and the gas delivered direct from the gas-works to the distributing system. The higher working charges of the electro-motor in the winter months when it is in use are thus off-set by the smaller space it occupies as compared with the gas-engine, and the greater convenience in working.

The author concludes his communication with a comparison of the fall of pressure for different sizes of mains according to the formulæ of Pole, Jäger, Birkholz, and Fliegner respectively. A few figures may be given from this table, which refers to a length of main of 5 kilometres (5468 yards) passing 5500 cubic metres (194,000 cubic feet) of gas per hour.

Fall of Pressure According to Different Formulæ.

Diameter of Main. Inches.	Pole. Inches.	Jäger. Inches.	Birkholz. Inches.	Fliegner. Inches.
28	3·0	3·1	2·1	2·2
24	6·4	6·7	4·1	4·2
20	16·0	16·4	9·6	11·8
16	48·9	48·3	28·5	36·1
12	206	177	119	162
10	512	368	296	386
8	1563	812	904	1255

Jäger's formula gives figures greater than Pole's when the fall of pressure is less than 40 inches of water. For greater falls of pressure, Pole's formula gives results which are too unfavourable; and Herr Riedl has shown by experiments made at Crefeld that Birkholz's formula (which was based mainly upon observations on the Lubeck-Travemünde high-pressure main), is more nearly

correct for such conditions. Fliegner's formula (which was derived from exhaustive investigations on the main between the new gas-works on the Lake of Constance and the town of St. Gall), gives falls of pressure very similar to those of Birkholz, but rather more unfavourable, and at the higher falls of pressure approximating to the values given by Pole's formula. Unfortunately, it has not yet been established which formula should be applied in a given case, as all the formulæ are more or less empirical and apply to particular cases, but can lay no claim to general applicability. It is eminently desirable that as many and as exact experiments as possible should be made with existing high-pressure installations, so as to obtain clearer information on the fall of pressure in the transmission of gas under high pressure.

THE NAME OF THE PROPOSED "INTERNATIONAL CANDLE" UNIT.

[Communicated.]

In the "Memorandum" issued last May indicating agreement between America, France, and Great Britain as to a common unit of light, it was hoped the suggested name "International Candle" would be generally approved and obtain official international sanction. Whether objection be raised or otherwise to the unit as such, it would seem that its designation is not to pass without question. In the August number of the "Illuminating Engineer," M. Blondel contributes a short article on the subject, for the purpose of suggesting the advisability of having a common name for the agreed common unit of light. He appears to think that the expression "international candle" may lead to some confusion and trouble; and he gives his reasons. Dealing first of all with the word "candle," he points out that this is the name of a material object, and it is as unscientific to call the unit of intensity an "international candle" as it would be to call the unit of heat an "international stove." The prefix "international" is also objected to as being cumbersome, and too long either to write or to conveniently pronounce. It may therefore be dropped, with resulting confusion between this standard and other existing candle standards. The further fact that the names—"international candle" (I.C.), "bougie internationale" (B.I.), and "internationale kerze" (I.K.)—do not lend themselves to a common symbol, is given as a third reason of the inadequacy of the expression.

M. Blondel proposes the adoption of a new name, either the Greek "pyr" or "phos," or a scientist's name, such as "Violle." The latter would appear to be perferred, since the symbol "V" or "Vi" is suggested. Initially, in order to comply with the existing custom, each country could associate the name of the unit with the name of the material object actually employed, as, for instance, in "25 Viol candles" or "25 V. candles," much as the Germans now say "25 Hefner-Kerzen."

From the mere point of view of philological accuracy, there is something to be said against the use of the word "candle." It would seem, however, on the face of it, altogether inadvisable to drop, without very serious cause, a term which has become so universally known and understood. There are many words in all languages which have, in usage, lost their true etymological meaning, but nevertheless are found exceedingly useful; and if the word "candle" with its prefix does ultimately serve to denote intensity, the utility of the expression will be its best excuse.

The term in each of the countries concerned is a well-known one. Whatever its defects as a standard of comparison, or however much the several candles may differ, the candle has been the forerunner and the basis of most of the suggested and established primary standards. In England and in America, it will be remembered in its measure and derivative, the 10-candle pentane standard; in France the name has established itself in the bougie décimale, approximately one-tenth of the accepted carcel standard; and in Germany a candle unit, officially adopted in 1868, although supplanted by the Hefner in 1884, had at least found a place in the nomenclature of the lighting industry. The expression "candle" is, in fact, the only one which has at one time or another been international in character. It has stamped itself, so to speak, into photometrical language and literature, and by reason of its familiarity to technician and layman alike, and its usage in so much that has been printed and published, it would now be a pity to lose it. The word applied as a unit of light is exceedingly useful; since, while it is never likely to be confused with the material object, it both suggests its origin and is an understandable measure for the general public.

The writer cannot quite agree with M. Blondel that the prefix "international" is particularly inconvenient. It is a necessary expression to indicate agreement between the nations concerned, and gives the "candle" a distinctive title. For initial purposes, it cannot be considered more cumbersome than the suggested alternative "Viol candle." The prefix may ultimately be dropped in ordinary parlance; but the unit will, it is hoped, have so far further established itself that the photometrical term "candle" will be understood to mean the "international candle," and all other and less used candle standards—such as the sperm, or the paraffin—can be designated, as they should be, with their explanatory prefixes.

The question of a common symbol is more worthy of consideration; but there should be no great difficulty in the general adoption of some letter which all technicians, whom only it would concern, may readily recognize. M. Blondel points out that the terms "international candle," "bougie internationale" and "internationale kerze" yield dissimilar initial letters. He gives the derivation of the English "candle" as from the Latin *candela*; the French "bougie," from *chandelle de Bougie*, a city near Algiers; and the German "kerze" from the Latin *cerata* (French *cierge*). Although M. Blondel does not suggest this at all, it would seem that the initial letter "C" of the Latin roots would serve admirably for the common symbol of the proposed "international candle."

M. Blondel concludes his short note by suggesting that where measurement of spherical or hemispherical candle power is referred to, the sign ⊕ ◡ or ◠ should be added after the symbol. These signs differ from those proposed by the Zurich International Photometric Committee by the addition of a horizontal bar; and it must be agreed that the addition is likely to improve the distinctiveness of the signs.

EARLY DAYS OF GAS SUPPLY AT YARMOUTH.

There has lately been brought under our notice by Mr. Thomas Glover, of Norwich, an interesting document connected with the early days of gas supply in Great Yarmouth. It is dated Aug. 14, 1840, and is consequently just over 69 years old. The gas lighting of Great Yarmouth, as Mr. W. J. Carpenter, the present Engineer and General Manager of the Gas Company, told members of the Eastern Counties Association at their meeting in April, was inaugurated in 1824, when Mr. G. S. Palmer contracted with the Paving Commissioners to supply the town with what was then a new illuminant. Subsequently the Company was formed, and they seem to have done good business, and were desirous of extending it, for at the date of the circular they had just effected extensive improvements in their plant, whereby they were able to afford a more ample and uniform supply of gas; and they submitted to the inhabitants an amended scale of charges for different-sized burners, without meter, distinguishing the summer and winter quarters, and the charge per 1000 cubic feet if supplied by meter. The figures are so representative of the early system of supplying gas, and are in such striking contrast to that now general, that they are worth reproduction. The following are the quarterly charges on the "per burner" system.

Summer Quarters.

Description of Burners.	Nine o'Clock.	Ten o'Clock.	Eleven o'Clock.	For every Extra Hour.
	Six Days per Week.			
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Argand, 14 jets . .	0 9 6	0 11 6	0 14 0	0 2 6
,, 10 ,, . .	0 7 6	0 9 6	0 11 6	0 2 0
Cockspur	0 6 3	0 8 0	0 9 9	0 1 9
	Seven Days per Week.			
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Argand, 14 jets . .	0 10 6	0 13 6	0 16 6	0 3 0
,, 10 ,, . .	0 8 9	0 11 1	0 13 5	0 2 4
Cockspur	0 7 3	0 9 3	0 11 3	0 2 0

Hall-light, until bedtime, £4 per annum, or 10s. per summer quarter.

Winter Quarters.

Description of Burners.	Nine o'Clock.	Ten o'Clock.	Eleven o'Clock.	For every Extra Hour.
	Six Days per Week.			
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Large argand . . .	1 8 6	1 14 6	2 2 0	0 7 6
Small ,, ...	1 2 6	1 8 6	1 14 6	0 6 0
Cockspur	0 18 9	1 4 0	1 9 3	0 5 3
	Seven Days per Week.			
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Large argand . . .	1 11 6	2 0 6	2 9 6	0 9 0
Small ,, ...	1 6 3	1 13 2	2 0 3	0 7 0
Cockspur	1 1 9	1 7 9	1 13 9	0 6 0

Hall-light, until bedtime, £4 per annum, or £1 10s. per winter quarter.
Charge per meter, 10s. per 1000 cubic feet.

The following were the regulations to be observed and the conditions on which gas would be supplied.

1.—Places of public religious worship, manufactories, dye-houses, inns, public-houses, warehouses, fish-houses, dwelling-houses, and all places where the time of burning is irregular, supplied by meter only.

2.—The meters are furnished by the Company at prime cost or on a rent charge, a scale of which is at the office of the Company.

3.—All rents by burners to be paid in advance quarterly, and all rents by meter to be paid quarterly, within fourteen days from the expiration of the quarter.

4.—All consumers not using meters are supplied with burners by the Company, and no other burners can be allowed to be used.

5.—Consumers paying by burner are not allowed to use any other kind than those named in the foregoing scale, nor to change the number or description, except at quarter-day; and a written notice must be previously delivered at the office of the Company, stating the nature of the intended alteration.

6.—No argand burner to be used without a glass where a meter is not used, or one-fifth more will be charged.

7.—No extra charge will be made if the light be extinguished within one quarter-of-an-hour of the time contracted for, and one hour extra is allowed on Saturday nights.

8.—The Company recommend straight chimney glasses; the gas burning more steadily in them. If too large a flame be attempted to be produced, the light will be injured both in cleanliness and brilliancy, and a quantity of unconsumed gas and carbon pass off, to the injury of the Company, to the consumers at large, and to the annoyance of the party so burning the gas.

9.—Persons wishing street or other lights, which cannot be supplied by measure, must make a specific agreement with the Company; and all persons taking the gas are expected to enter into a contract or agreement, stating the terms on which they are to be supplied.

10.—The fittings and services from the Company's main must be paid for by the consumer; and the Company will supply them as moderately as possible, under the superintendence of their foreman.

11.—All persons wishing to be supplied with gas are requested to apply to the Collector or at the Company's works.

12.—Experience has placed beyond the least doubt that a coke fire, for domestic or other purposes, is the most economical that can be used; but there is an advantage of much greater importance, as it tends to augment the comforts of the poor, by enabling them to have a cheerful fireside for about half the price of coals. The coals now used at the gas-works produce a quality of coke quite equal to that made for the express purpose of the maltsters, and is offered for sale at an extremely moderate rate, and with a diminution in price if taken in large quantities.

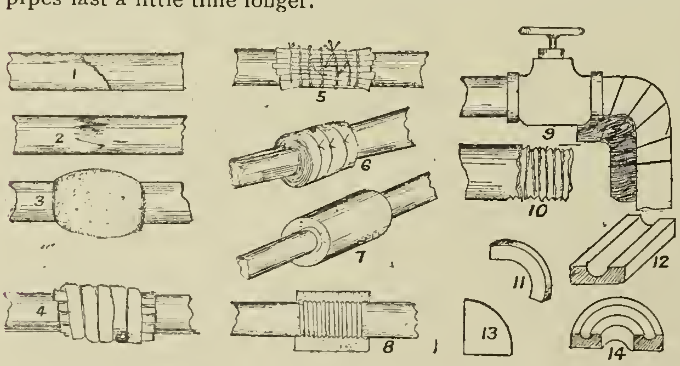
13.—Any deviation from the above regulations and conditions will oblige the Company to discontinue the supply, and the charges which the consumer may have paid in advance will become forfeited.

14.—The charges of the Company having been reduced, no discount will in future be allowed.

PIPE REPAIRING IN EMERGENCIES.

A recent number of the "American Gaslight Journal" contained the following communicated article on this subject.

Several different methods of quickly repairing leaks in gas-pipes may be classed under various heads. There are the shrinking-on descriptions, the splint system, the bonding class, the wrapping method and others. These classes of emergency pipe repairing were formulated by the automobile people, who found it necessary to utilize emergency repairing schemes for leaks and breaks in gas-engine pipes. The gas-engine machinists were not long in adopting classifications of pipe wrapping and bonding to make a split or cracked pipe do service until such time as a new joint might be put in. The gas engineering fraternity have adopted some of the types of emergency leak repairs for ordinary house gas-pipe service. Hence, in the annexed illustrations are shown some of the plans utilized for closing gaps and making defective pipes last a little time longer.



The types of fractures may be placed under two general heads, illustrated in figs. 1 and 2. The break in the pipe may be straight or diagonally across, as in the first diagram; it may be a ragged, dove-tailed break, as in the second; or the leak may be due to a pinhole, or to the fact that, the pipe having been crushed, the collapsing of it resulted in developing leaky places. Again, the trouble may be at a leaded union, or the packing may be worn or imperfect. The various kinds of defects have to be taken into consideration. Of course, the first move involves placing the ends together, and, if possible, putting a jacket on, or other means adopted to retain the alignment of the broken ends. Clay is used to close the joint, if other material is not at hand, and cork wrapping has been employed in cases with good results. Cork can be bought in strips and be wound about the joint, which should then be bound up with wire. The workman can bunch-up the cork, as shown in fig. 3, and wind it, or he can adopt the splint method, as in fig. 4, which consists in putting thin pieces of wood about the fracture, and binding up with tape or cord. The wood pieces are packed with clay or lead, and a wrapping of tape wire adds to the security. Another method of this class is shown in fig. 5. Strips of cork can be used advantageously for the splints. Sometimes pieces of leather or rubber are employed.

The common fabrical wrapping system is shown in fig. 6. The broken ends of the pipe are properly adjusted; then cotton cloth, or strips from an old blanket or gunny sacking, are wound securely round the closed union, thickness after thickness, until a shoulder is made. Then the whole combination is wound with wire to make it solid. The process of shrinking on a section of metal sleeve, as in fig. 7, is used in some shops. The piece which is shrunk on often consists of piping the next size larger in diameter than the original. Then, again, a piece of metal is bored out to fit over the pipe ends, when, after the sleeve is on, the pieces are brazed so as to effect a tight joint. The threaded-end system of uniting two broken ends requires more mechanical work than most men desire to put into an emergency job. The broken ends having first been made square, they are each cut with a thread, and a sleeve similarly threaded is turned on, as shown in fig. 8. This type of closed fracture is quite permanent in its nature.

In some shops there are an assortment of wooden and metal forms for use as supporting braces or brackets for fractures in curves. In fig. 9, for example, the turn in the pipe is broken. It being impracticable to set the fracture and retain it in a fixed order without properly formed supports, the supporting brace shown in the shaded part is made of hard wood and applied. The hard-wood form should be cut to the shape of the broken union, then the form can be put in position, and the piping wired fast to it as illustrated. Of course, there are men who carelessly undertake to make a leaking threaded union secure by simply winding some twine or cotton thread between the cut threads of the pipe end, as shown in fig. 10. The threads fill up a void, and make a loose union more secure by causing the threads to cling tighter; but it is a slipshod manner of doing work, and cannot be encouraged.

In regard to the types of forms of hard wood and metal which may be carried in stock for affording means for gripping on pipe turns, the next figures exhibit specimens. The style shown in fig. 11 can be fitted under a curved pipe and wound into position with wire, cord, or tape. Fig. 12 is a common base with a groove for the pipe. Fig. 13 shows the block form necessary in giving an underneath support to certain turns of pipes. Then there is the half-turn block, as in fig. 14, made so that a section of pipe making a turn can be accommodated with a grooved resting-base.

Temperature of the Bunsen Flame.

The "Journal für Gasbeleuchtung" quotes a report of the German Physical Society on researches made by Herr H. Schmidt, of the Physical Institute of the University of Berlin, on the laws of radiation of the bunsen flame. On the basis of the laws of pure temperature radiation, he ascertained the temperature of the bunsen flame from emission and from absorption. Optical-pyrometric determinations of emissivity gave a temperature of about 1600° C. in the middle, and of about 1800° C. at the edge of the flame, with a mean temperature of about 1640° C. From the absorptive power of the flame, a mean temperature of 1630° to 1695° C. was found—the most probable figure being 1670° C. The two values of 1640° and 1670° C. found by the two different methods, therefore, agree very well.

Recent Wills.—Mr. William Andrew M'Intosh Valon, of The Lodge, Kennington, Ashford, and of Caxton House, Westminster, whose death was recorded in the "Journal" for the 6th ult., left estate of the gross value of £21,186, with net personalty £17,964. Testator bequeathed, on the death of his widow, £500 to his Secretary, Mr. W. H. Vince. Mr. John Marsland who was for some years the Manager of the Sowerby Bridge Gas-Works, left estate valued at £11,019. The late Mr. A. G. Sutherland, Director of the Sutherland Meter Company, whose death, under painful circumstances, was recorded in the "Journal" for the 15th of June, left estate of the gross value of £12,228. Alderman Richard Williams, J.P., of Wednesbury, at one time a Director of the South Staffordshire Water Company, left estate valued at £32,388 gross, with net personalty £30,090.

Liquid Gas in Switzerland.—The production of liquid gas at Bassersdorf, Switzerland, for heating, lighting, and similar uses, has passed beyond the experimental stage, according to a recent United States consular report from Zurich. The liquid gas is obtained by the distilling of raw petroleum and of bye-products of the lignite and oil industries. Its prime cost is stated to be no greater than that of any other kind of gas produced in small plants. It is easily transportable; it is non-poisonous and three times less explosive than coal gas; and it has a high illuminating and heating power. It is stated that the installation costs are low, and the manipulation is simple and without danger. Gases not liquefied are employed in the working of the factory. The gas has been used in more than a hundred installations in Switzerland, all of which are declared to be entirely satisfactory to the purchasers in their operating results.

FURTHER STUDIES IN COAL CARBONIZATION.

In the notice of the last Annual Report of Mr. R. Forbes Carpenter, the Chief Inspector under the Alkali Works Regulation Act, 1906, which appeared in the "JOURNAL" for the 15th of June (p. 707), reference was made to the further studies in coal carbonization which had been carried out under Mr. Carpenter's supervision during the year. The crowded state of our columns at the time only allowed of an indication being given of the nature of these researches; but, in view of their importance, we now reproduce this portion of the report.

INTRODUCTORY.

In the course of remarks made last year on the special features presented by some of the products resulting from the distillation of coal in continuous and intermittent vertical retorts,* attention was directed especially to ammonia and hydrocyanic acid, and to the proportionate relationship between these bodies in the liquors resulting from the cooling, condensing, and washing processes to which the gases are subjected on leaving the retorts. These proportions were found to vary with the method of retorting as well as with the nature of the coal carbonized. It was also stated that, in addition to the generally accepted hypothesis for the formation of hydrocyanic acid at the expense of ammonia already existing, by the latter meeting with highly incandescent carbon on its way out of the retort, a possible alternative hypothesis had been brought to my notice, of its formation by the reaction of ammonia on marsh gas at the temperatures obtaining in the retort. This was deemed a subject worthy of investigation; it being thought possible that incandescent carbon might play the part of a catalyte at a temperature below that at which it is itself competent to take its own active part in the reaction.

The record of experiments conducted by Dr. F. Bergmann, at the suggestion of Dr. Bunte, at Carlsruhe in 1896,† was studied, as also the later results, conflicting in many respects with the above, of experiments by Denis Lance in the "Comptes Rendus" (124), as preliminaries to consideration of fresh experimental work in my own laboratory. It was felt that only by limiting variation of conditions in the experiments, as far as possible, to one at a time, of the factors entering into the reaction could any two experiments be usefully compared. The failure to observe this precaution had vitiated the certainty of many of the conclusions drawn by Dr. Bergmann from his own research.

It was decided, therefore, to aim at beginning with the simplest conditions that could be devised; working with mixtures of marsh gas and ammonia at temperatures comparatively low, and with a neutral substance as catalyte that it was thought would undergo no chemical change at the temperature chosen. Provision was made for measurement of the outgoing gases as well as those entering as an essential feature in the scheme of work, so that balance-sheets could be prepared from the analyses made.

So many difficulties of various kinds, however, arose from employing specially prepared marsh gas, that coal gas deprived of its illuminants by fuming sulphuric acid was employed in the rest of the research. In only two of the completed experiments here recorded did marsh gas of special preparation take part. The results of these are given in Table VA., experiments Nos. 15 and 18. The maximum purity obtained was 86·3 per cent. marsh gas, the balance of the amount not used in No. 15 being utilized in No. 18, being made up to the volume required by addition of coal gas deprived of illuminants, as above stated.

The researches of Professor Bone—especially those presented by Messrs. Bone and Coward to the Chemical Society in 1908—have been of great value in indicating at what temperature methane itself begins to undergo decomposition by heat in presence of porcelain. The amount of such decomposition is stated to be insignificant below 800° C. for pure methane in porcelain tubes, even when packed with quicklime to give increase of surface. This was confirmed here for the diluted methane employed (*cf.* experiments Nos. 4, 7, and 8). Moreover, when higher temperatures (985°-1015° C.) were employed, the authors state: "The use of porous porcelain for this purpose was found to be inadmissible, owing to the readiness with which it is attacked and reduced by the methane (or possibly by the carbon deposited from methane) at this temperature." They further go on to state: "How strong this reducing action is may be gathered from the fact that in one experiment, in which the tube was packed with this material, the gases contained no less than 10·5 per cent. of carbon monoxide after 30 minutes, and 22·5 per cent. after 60 minutes (nitrogen = 0·7 per cent. only)." For this reason, porcelain as contact material was replaced in the authors' researches by quicklime, when after 60 minutes' contact and circulation the gases contained only 2·8 per cent. of carbon monoxide. The authors used the method devised by Messrs. Bone and Wheeler, of continuous circulation of the gases under study; the whole apparatus constituting a closed circuit.

Confirmation of these facts was obtained here in the later researches at higher temperatures; but still not so high as those named by Messrs. Bone and Coward. When the temperature exceeded 800° C. in the experiments conducted here, a marked darkening was noticed of the broken porcelain to grey, due to slight deposition of both iron and carbon from the gas. Up to that temperature, such alteration in colour was slight. Before commencing research on the mixture of methane and ammonia, it was necessary to ascertain the behaviour of methane (here and subsequently the coal gas deprived of illuminants is always to be understood) at different temperatures, comparatively low—700°–800° C.—in presence (*a*) of the neutral contact substance porcelain, and (*b*) of the possibly active substance carbon in the form of wood charcoal, before proceeding to the more complex problem presented by the reactions where two decomposable gases were involved at temperatures of higher grade (830°–930° C.). The exigencies also caused by inability to obtain a temperature of 800°–810° C. at will with an Erlenmeyer furnace dictated this course. Subsequently a 10-burner Méker furnace was used, with which all the later and all higher temperature work was done.

The work opened out as it proceeded. The influence of moisture on the decomposition of methane in presence of carbon was found to be a subject on which knowledge had to be gained; so that the experiments had to include comparison of dry and moist methane upon porcelain and carbon respectively. Those on dry dilute methane, though not coming first in order of time, are presented in Tables IA. and IB. In the latter of these a methane balance is presented. The variables here are temperature and contact substance; amounts of gas passed and rates of flow being approximately constant. Table IB. summarizes quantitatively the results of Table IA., and brings into prominence the salient points to be grasped.

The results of similar treatment of diluted methane saturated with aqueous vapour at different temperatures, and the behaviour of the same two contact substances, are presented in Tables IIA. and IIB.; the latter table equally acting as a quantitative summary to the former. It will be noticed that the yield of ammonia finds record in the wood charcoal experiments only in Table IB. —see "Conclusions" following. It is presented for both contact substances in Table IIB.; hydrocyanic acid only making its appearance at the higher temperature obtained later with the Méker furnace.

Results of these (wood charcoal) contact experiments—those at 935° C. being the latest in order of time, and made with all the experience gained during the research—are presented in Tables III. (A and B) and IV. The variable in the experiments at 935° C. is "rate of flow," other conditions being kept as constant as possible. In Table IIIB., a methane balance is also presented, and hydrocyanic acid appears for the first time.

APPLICATION OF EXPERIMENTS TO GAS-WORKS OPERATIONS.

It is manifest, from consideration of these seven tables, that in applying the knowledge of the facts ascertained to large-scale operations in gas-works and coke-ovens, the consideration of what is described here as "rate of flow" has an enormous influence on the products obtained in coal carbonizing. Temperature is by no means the only factor of importance. This is also emphasized by Professor Bone*. When it is considered that the raw material dealt with in these experiments is the ultimate product of high-temperature, but also of high-speed, carbonization—purified, of course, for domestic consumption—an idea of the importance of realizing what is possible to happen in the retort is gained. Perhaps the nearest large-scale results to which I am enabled to point as to rate of flow and its effect on methane were contained in Mr. Short's paper quoted last year, where in the coke-oven tested the percentage of methane fell from 23 to 4 within the last five hours. Of course, here the central area, a principal channel for the escaping gases, was in this period rapidly rising to coking temperature.

INTERACTION OF METHANE AND AMMONIA.

Having stated results of the simpler problems presented for study, I proceed to consider the more intricate and complex conditions surrounding the next portion of the subject—the inter-action of methane and ammonia. Here the volumes of gas dealt with were larger, not only by reason of the presence of ammonia, but on account of the necessity of employing a large volume of coal gas deprived of illuminants as protecting diluent; also a fair proportion of the latter was required for sweeping forward products of reaction when the supply of ammonia was cut off. This latter, it will be seen, amounted to from 444 c.c. to 510 c.c. in each experiment; in only one instance (Table VIA., experiment No. 21) did this volume markedly fall below 400 c.c. In manipulating the apparatus to ensure delivery of correct proportions of methane and ammonia, the two bodies whose action was to be studied, in a steady continuous stream over the whole period of trial, much vigilance had to be exercised. The disturbing influence of varying increase of volume in the outgoing gases had also to be provided for, so that rates of flow in the experiments, with the best endeavours to keep this factor constant, were found to vary more than could have been wished when the results came to be calculated out. On the other hand, as great uniformity as could be looked for in this respect characterizes the rates of flow recorded in Tables IA. and IIA.

In Tables VA. and VIA., results are grouped according to rates of flow designated as "slow" and "rapid;" but these terms only apply relatively to the conditions laid down for the experiments as conducted in the laboratory with the apparatus and assistance at command. In Table VA. are grouped the experiments at varying temperatures and on the two contact substances at slow

* See "JOURNAL," Vol. CIII., p. 112. † *Ibid.*, Vol. LXVII., p. 1032.

* See "JOURNAL," Vol. CIII., p. 321.

TABLE IA.—*Action of Porcelain and Wood Charcoal on Dry Coal Gas.*

0° C., 760 mm.	Porcelain. 230 c.c., 200 Grammes.								Wood Charcoal. 230 c.c., 68 Grammes.			
	White.		Grey.		Dark Grey.		Dark Grey.					
	900° C.		860° C.		870° C.		770° C.		735° C.		835° C.	
	Entering.	Leaving.	Entering.	Leaving.	Entering.	Leaving.	Entering.	Leaving.	Entering.	Leaving.	Entering.	Leaving.
Experiment No.	1		2		3		4		5		6	
Coal gas used . . . . c.c.	2395	3115	2340	2865	2360	3015	2400	2485	2305	2700	2300	2860
Per 100 volumes—												
CO_2	0·1	0·2	0·1	0·1	0·1	..	0·1	0·4	0·1	0·6	0·1	0·4
O	0·4	0·1	0 6	..	1 0	..	0·6	..	0·6	0 1	1·2	..
CO	13·6	18·9	13·1	14·8	12·6	14·7	17·1	16·5	15·6	13·5	16·9	13·5
CH_4	30·5	11·6	31 7	11·9	31·8	8·6	28·5	28 0	29·3	14·4	28·1	8·6
H	49·8	62·6	52·7	68·4	49·0	70·6	49·6	51·1	50·5	64·7	47·7	70·9
N	5·6	6·6	1·8	4·8	5·5	6·1	4·1	4·0	3 9	6·7	6·0	6·6
	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
Duration of experiment, minutes	63	..	64	..	60	..	59	..	59	..	61	..
Rate of flow . . c.c. per minute	38	..	37	..	39	..	41	..	39	..	38	..
Increase in volume, per cent. of gas entering	..	30·1	..	22·4	..	27·8	..	3·5	..	17·1	..	24·4
Gas in tube . . . . minutes	2·6	..	2·7	..	2·5	..	2·4	..	2·0	..	2·1	..

TABLE IB.—*Distribution of Products. Dry Methane.*

—	Porcelain.				Wood Charcoal.	
	White.	Grey.	Dark G.ey.	Dark Grey.		
	900° C.	860° C.	87c° C.	770° C.	7:5° C.	8 5° C.
Experiment No.	1	2	3	4	5	6
Methane balance—						
CH_4 entering, calculated as carbon grammes	0·393	0·398	0·403	0·367	0·364	0·348
Products per cent.—						
CH_4 undecomposed	49·4	46·0	34·7	101 9	57·4	38·0
Oxidized to $\left\{\begin{array}{l}CO_2\\CO\end{array}\right.$	$\left.\begin{array}{l}0·5\\36·1\end{array}\right\}$ 36·6	$\left.\begin{array}{l}0·3\\15·8\end{array}\right\}$ 16·1	$\left.\begin{array}{l}Nil\\19·1\end{array}\right\}$ 19·1	$\left.\begin{array}{l}0·8\\Nil\end{array}\right\}$ 0·8	$\left.\begin{array}{l}2·2\\0·8\end{array}\right\}$ 3·0	$\left.\begin{array}{l}1 1\\Nil\end{array}\right\}$ 1 1
As hydrocyanic acid	..	*Nil*	*Nil*	*Nil*	*Nil*	*Nil*
As solid carbon (by difference)	14·0	37 9	46·2	−2 7	39·6	60·9
	100·0	100·0	100·0	100·0	100·0	100·0
Ammonia obtained . gramme	..	..	..	..	0·003	0·004

rate of flow; while in Table VIA. are presented experiments at varying temperatures and at rapid rate of flow on wood charcoal only as contact substance. At this stage in the research, it was thought of more importance to bring such of the conditions as were under control into as close harmony as possible with those existing in a coal-carbonizing retort, without attempting in any way to reproduce these on a laboratory scale. In Tables VB. and VIB. are presented, in summary form, the most important of the results obtained under these conditions. Distribution of products, both *qua* decomposition of ammonia and of methane, are presented in percentage form.

While in Table VB. in experiments Nos. 14 and 15, with porcelain as the contact substance, the ammonia balance shows distinctly the genesis of hydrocyanic acid at 780° C. and 800° C. at slow rate of flow, no evidence was obtained with wood charcoal as the contact substance, under the same conditions *qua* rate of flow, till 805° C. was reached. On pushing the temperature to a maximum 930° C. (experiment No. 20) and diminishing the rate of flow to a minimum, instead of getting, as anticipated, a marked yield of hydrocyanic acid, there was only a trace. The bulk of the ammonia also was decomposed. The results presented in Table VIB. show how the research was then pursued. First the rate of flow was tripled as compared with experiment No. 20. Unfortunately, *qua* temperature, intended to be kept constant, the maximum of 930° C. was not obtainable when No. 23 was run; but the yield of hydrocyanic acid increased practically up to the maximum attained up to that point.

The proportion of ammonia decomposed—two-thirds at 930° C. (No. 20)—suggested that, by slightly lowering the temperature, a still further yield of hydrocyanic acid might be looked for. The results followed expectation. Experiment No. 22 shows 19·7 per cent. of the nitrogen in the ammonia appearing as hydrocyanic acid in the outlet gases. On dropping the temperature still lower, the rate of flow being the same, it will be seen (No. 21) that while the ammonia decomposed dropped to 6·2 per cent., the hydrocyanic acid figure fell also approximately to that obtained subsequently in No. 19. The critical point of formation of hydrocyanic acid from ammonia in presence of methane appears, therefore, to lie at or slightly below 800° C. with both the contact substances tried, and at very varying rates of flow. No opinion is expressed as to the probable course of reaction—whether hydrocarbons other than methane (*e.g.*, ethane) first decompose, and ammonia reacts on the bodies of fugitive existence mentioned by Professor Bone in his paper already referred to, or whether reaction is preferably on separated carbon derived either from the methane or the wood charcoal employed as contact material.

Finally, attention is directed to Table IIIB. presenting results of an experiment (No. 11) conducted on a methane mixture containing hydrocyanic acid without addition of ammonia, to ascertain the stability of this body under conditions similar as regards temperature and rate of flow to others recorded in this series (*cf.* experiments Nos. 16 and 20) where ammonia was originally present, but was largely destroyed in the course of transit through the experimental tube. One of the contentions of Denis Lance, in opposition to Dr. Bergmann, was that hydrocyanic acid, formed either from its elements or by decomposition of ammonia, always appeared at the finish as ammonium cyanide. The experiments above alluded to (Nos. 16 and 20) seemed to point to Lance's conclusion as possibly correct, and No. 11 was designed to ascertain if nitrogen as ammonia in excess of nitrogen equivalent as hydrocyanic acid was essential to the existence of the latter under the conditions of the experiment. In the result, more hydrocyanic acid appeared at the outlet than entered; pointing to formation of hydrocyanic acid from gaseous elements and carbon having taken place. The possibility of this was confirmed in further experiments, Nos. 12 and 13, Table IIIA., conducted at the same temperature as No. 11.

APPLICATION TO VERTICAL RETORTS.

Again endeavouring to translate results and apply them to large-scale conditions, in the continuous vertical retort a zone of maximum and continuous heat exists perhaps at about three-fifths of the depth of the retort, measuring from the top. Here the coal has thoroughly coked, the horizontal section will, under normal condition, be well filled with incandescent solid, with absence of any central gas channel such as characterizes the horizontal section of an intermittent vertical retort. Here also the gas pressure, small as this is on the continuous vertical retort, will be at a maximum, while the rate of flow of gas from its diminishing evolution will be much lessened as compared with higher zones in the retort—conditions all favouring decomposition of methane and any accompanying ammonia, and formation of hydrocyanic acid from its elements. It is in this zone also, and somewhat lower, that it seems reasonable to look for formation of ammonia, if the reactions of hydrogen on the nitrogen existing in the coal still not completely carbonized have any actual existence,* since the ammonia, if formed, has better chance of survival in the higher zones of the retort. The suggested introduction of blue water gas at the base of the retort has not yet been experimentally effected, owing to the exigencies of other prior claims in the pioneer plant at Poole.

* *Cf.* Forty-Fourth Annual Report, pp. 71, 72.

Table IIa.—*Action of Porcelain and Wood Charcoal on Moist Coal Gas.*

0° C. 670 mm.	Porcelain (Light Grey). 310 c.c., 270 Grammes. Coal Gas Saturated with Moisture at 21° C. — 765° C. Entering.	Leaving.	50° C. — 715° C. Entering.	Leaving.	Wood Charcoal. 270 c.c., 80 Grammes. Coal Gas, Saturated with Moisture at Dry. — 735° C. Entering.	Leaving.	50° C. — 745° C. Entering.	Leaving.	70° C. — 720° C. Entering.	Leaving.
[E]xperiment No.	7		8		5		9		10	
[C]oal gas used (dry) . . . c.c.	1920	1935	2315	2300	2305	2700	2300	2950	2305	2805
Per 100 volumes—										
CO_2	0·3	0·8	0·1	0·3	0·1	0·6	0·2	1·0	0·1	0·8
O	0·7	0·1	1·0	0·2	0·6	0·1	1·0	0·1	0·9	0·3
CO	12·1	12·0	14·1	14·2	15·6	13·5	14·1	14·9	14·2	14·7
CH_4	31·0	30·2	30·6	29·5	29·3	14·4	30·0	12·2	29·4	12·9
H	50·5	51·1	46·2	48·2	50·5	64·7	49·0	64·8	50·3	64·7
N	5·4	5·8	8·0	7·6	3·9	6·7	5·7	7·0	5·1	6·6
	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
[A]queous vapour . . . c.c.	48	..	319	..	*Nil*	..	316	..	1020	..
[D]uration of experiment . . . minutes	45	..	57	..	59	..	60	..	61	..
[R]ate of flow (moist gas) . . . c.c. per minute	44	..	46	..	39	..	44	..	55	..
[I]ncrease in volume . . per cent. of dry gas entering	..	0·8	..	0·5	..	17·3	..	28·7	..	22·1
[G]as in tube . . . minutes	3·1	..	2·9	..	2·4	..	2·1	..	1·7	..

Table IIb.—*Distribution of Products. Moist Methane.*

—	Porcelain (Light Grey). Coal Gas, Saturated with Moisture at 21° C. — 765° C.	50° C. — 715° C.	Wood Charcoal. Coal Gas, Saturated with Moisture at Dry. — 735° C.	50° C. — 745° C.	70° C. — 720° C.
[E]xperiment No.	7	8	5	9	10
[A]queous vapour . . . gramme	0·038	0·257	*Nil*	0·255	0·821
[M]ethane balance—					
CH_4 entering, calculated as carbon . . gramme	0·320	0·381	0·364	0·371	0·365
Products, per cent.—					
CH_4 undecomposed	98·2	95·8	57·4	52·3	53·2
Oxidized to {CO_2, CO}	1·5	0·8	2·2 0·8 } 3·0	3·5 16·7 } 20 2	3·0 12·6 } 15·6
As hydrocyanic acid	..	*Nil*	*Nil*	*Nil*	*Nil*
As solid carbon (by difference)	0·3	3·4	39·6	27·5	31·2
	100·0	100 0	100·0	100·0	100·0
[A]mmonia obtained . . . gramme	0·001	0·002	0·003	0·008	0·005

In the course of the many months that have elapsed since these experiments were commenced, my attention was directed by Dr. Harold Colman to the report of a research undertaken at Carlsruhe by Messrs. Mayer and Altmeyer* on the equilibrium between methane, hydrogen, and carbon. Their experiments were conducted on pure methane specially prepared from aluminium carbide, purified first by copper oxide, then soda, and finally concentrated sulphuric acid. The contact substances in their reaction were nickel and cobalt, reduced *in situ* by hydrogen, and deposited as a thin film on fragments of porcelain. These contact substances they regard as catalytic agents which do not affect the final equilibrium, but simply cause this to be attained more rapidly. The rate of flow through the reaction-tube—a U-tube heated in a molten lead bath—was only at the rate of two to three bubbles of gas per minute. Under these conditions, they state that methane suffers notable decomposition, and at an increasingly rapid rate, to carbon and hydrogen between 400° C. and 600° C. Their paper includes a diagram on which a curve is plotted showing the relative proportion of methane and hydrogen at temperatures ranging from 250° C. to 850° C. I understand that the curve is not accepted as accurate for the higher range of temperatures by other observers and students engaged also in this research (working, moreover, by different methods), as it does not accord with observed facts.

It will be seen from Mr. Linder's memorandum that Messrs. Mayer and Altmeyer's conclusions cannot be tested by the results set out in the tables, since the presence of hydrocarbons other than methane in the coal gas when deprived of illuminants, both before and after passing the reaction-tube, may well be surmised as probable; indeed, the relationship of hydrogen to the carbon balance showed in many cases that methane was not the only hydrocarbon present, though the carbon present was returned as such. Under the circumstances, no other course was possible.

I have requested Mr. Linder to prepare a short account of the apparatus used, the procedure, methods observed in calculations for presenting results, and analytical notes on the tables that follow his remarks.

* *Vide* "Berichte," 1907, pp. 40, 2134; also "Journal," Vol. XCVIII., pp. 27, 157.

Apparatus and Procedure.

(1) *Train of Scrubbing Cylinders to Purify the Coal Gas Employed from* (*a*) carbon dioxide, by soda lime and caustic soda; (*b*) hydrocyanic acid, by soda lime and caustic soda; and (*c*) ammonia, illuminants, and nitrogenous bases—pumice moistened with fuming sulphuric acid. [*Note.*—No special treatment was applied to remove "sulphur compounds," as it was unnecessary to take account in the analysis of the traces of sulphuretted hydrogen formed therefrom in the furnace tube and absorbed in the soda catch on the exit gases. Such sulphide was removed by shaking with lead carbonate before estimation of the cyanide.] This purified coal gas, stored over water in a bolt-head flask, was alone used throughout the experiments, with two exceptions, Nos. 15 and 18, already referred to; and the expression "coal gas" throughout must be taken as denoting the purified product.

(2) *Coal Gas Reservoir.*—A 13-litre bolt-head flask with paper scale calibrated throughout. The mouth was closed with a thick rubber bung, provided with suitable connections to enable the flask to be filled as required with purified coal gas and placed in connection, by means of pressure tubing, with water-gauge and mixing-flask. The bung was also fitted with a thermometer adjustable at any desired height. The various fittings made it possible to adjust the pressure of the gas at any desired moment, either for the purpose of measurement or the control of the gaseous current through the furnace tube.

(3) *Mixing-Flask.*—A 250 c.c. distilling flask, in a water bath, and placed in connection by pressure tubing with coal gas reservoir, ammonia (or hydrocyanic acid) cylinder, and furnace tube. The mixing-flask served to fulfil the following functions: (*a*) When dry coal gas was under experiment (Tables Ia. and Ib.), the flask contained 100 c.c. of strong sulphuric acid, through which the inflowing coal gas was allowed to bubble on its way to a drying-tube filled with pumice moistened with acid, by means of which final traces of aqueous vapour were removed before the gas entered the furnace tube. (*b*) When moist coal gas was in use (Tables IIa. and IIb.), the flask contained 100 c.c. of distilled water maintained at the desired saturation temperature by means of a water bath. (*c*) When the ammonia (or hydrocyanic acid) cylinder was in use (Tables III., V., and VI.), the empty flask served as a mixer for coal gas and ammonia (or hydrocyanic acid); the latter entering through a separate tube of small bore sealed below in mercury.

(4) *Ammonia* (*or Hydrocyanic Acid*) *Cylinder.*—A cylinder of capacity about 1100 c.c., provided with stopcock and small-bore delivery-tube above, and connected below with a mercury reservoir. The cylinder was filled with gas by placing it alternatively in connection with a vacuum

Table IIIa.—*Hydrocyanic Acid; its Stability in Presence of Wood Charcoal. Diluent Moist Coal Gas.*
Volume of Packing, 230 c.c.; 68 grammes. Temperature, 935° C.

0° C., 760 mm.	Hydrocyanic Acid and Coal Gas. Moist Gases per Minute, 0° C., 760 mm.		Coal Gas only. Moist Gas per Minute, 0° C., 760° mm.			
	78 c.c.		71 c.c.		145 c.c.	
	Entering.	Leaving.	Entering.	Leaving.	Entering.	Leaving.
Experiment No.	11		12		13	
Coal gas used (excluding HCy) dry . . . c.c.	4307	5160	4200	4810	4270	4550
Per 100 volumes—						
CO_2	0·1	0·1	0·2	0·2	0·1	0·1
O	0·6	..	0·7	0·1	0·8	0·3
CO	17·2	17·8	18·0	18·5	15·8	17·1
CH_4	27·2	12·2	27·4	16·9	27·7	21·4
H	48·7	62·8	50·2	57 8	51·0	54·7
N	6·2	7·1	3 5	6·5	4·6	6·4
	100·0	100·0	100·0	100·0	100·0	100·0
Aqueous vapour . . . c.c.	76	..	76	..	66	..
Hydrocyanic acid (dry) . . . c.c.	53	58	*Nil*	21	*Nil*	8
Duration of experiment . . . minutes	57	..	60	..	30	..
Increase of volume . . . per cent. of dry gas entering (excluding HCy)	..	19·8	..	12·6	..	6·5

Table IIIb.—*Yield of Hydrocyanic Acid and Ammonia, and Distribution of Products, Methane 935° C.*

—	Hydrocyanic Acid and Coal Gas.	Coal Gas only.	
	Slow Rate.	Slow Rate.	Rapid Rate.
Experiment No.	11	12	13
Aqueous vapour . . . gramme	0·061	0·061	0·053
Methane balance—			
CH_4 entering, calculated as carbon	0·630	0·618	0·637
Products, per cent.—			
CH_4 undecomposed	53·8	70·7	82·5
Oxidized to CO	15·2	11·5	8·6
As hydrocyanic acid	0 5	1·8	0·6
As solid carbon* (by difference)	30·5	16·0	8·3
[* This figure includes carbonic acid removed by final soda catch.]	100·0	100·0	100·0
Ammonia obtained . . . gramme	0·056	0·032	0·008
Hydrocyanic acid obtained (excess leaving over that entering) calculated as NH_3 . . . gramme	0·004	0·016	0·006

exhaust and a generating flask delivering pure dry ammonia gas. The cylinder was provided with a scale calibrated throughout. The volume of ammonia used for an experiment was about 500 c.c.; the remainder (about 600 c.c.) was absorbed in water, and titrated on N/2 H_2SO_4. This figure, together with volume, pressure, and temperature data, enabled the ammonia content of the gas actually used in an experiment to be determined with sufficient accuracy. The cylinder was also employed in one experiment (No. 11, Tables IIIa. and IIIb.) as a reservoir for dilute hydrocyanic acid. The diluent used was coal gas from the bolt-head reservoir. The hydrocyanic content of the gas used was determined by shaking the residual gas (600 c.c.) with caustic soda solution, as in the case of ammonia, and titrating with N/10 $AgNO_3$.

(5) *Furnace Tube and Packing.*—Tubes of fused silica were employed throughout 1 inch diameter inside measurement, and total length 3 feet. The volume of packing was adjusted so as to maintain practically the whole of it at the temperature of the furnace. Pyrometer readings were taken with two platinum platinum-iridium couples encased in small-bore silica tubes within and without; the reaction-tube itself showing extremely small variation (5° C. to 10° C.). The effective length of the packing was 24 inches in the Erlenmeyer furnace, 18 inches in the Méker burner; the ends of the tube projecting beyond the furnace in each case being kept empty, and at a temperature exceeding 100° C. to prevent condensation.

As regards packing, the porcelain employed was a pure white biscuit ware, broken down to the size of a small bean, and sieved to remove powder. On use, the colour turned grey, approaching to black after repeated use; but the colour was ingrained, and in no case did any flocculent carbon separate.

A sample of the dark grey material was found to contain, on analysis: Carbon, 0·32 per cent.; iron, 0·14 per cent. The discoloration was proved to be due to the presence of both carbon and iron, as the amount of the latter, after removal of the carbon, was sufficient to impart a distinct grey tinge to the porcelain. After extraction of both carbon and iron, the resulting material was pure white, indistinguishable in appearance from the original porcelain before use. The latter showed no loss of weight on ignition in air, and yielded traces only of iron on extraction with acid (0·004 per cent. Fe). The presence of iron in the grey material is attributed to the decomposition of iron carbonyl in the coal gas used.

The wood charcoal was that employed for blowpipe work, graded and sieved as in the case of the porcelain. (Ash, after repeated use, 1·7 per cent.) When first of all heated in a current of coal gas, a considerable amount of water was evolved and some pyroligneous matter. The material absorbed moisture readily, and retained it with extreme obstinacy, the evidence of its presence being afforded by the steady evolution of gases resembling water gas in composition when the charcoal was heated in coal gas. The difficulty was finally overcome by placing the furnace tube in each experiment under exhaust for several minutes at 800° C., destroying the vacuum with coal gas, and repeating the process two or three times.

The weight of contact material raised to constant reacting temperature and the volume of the tube occupied by it are given in the headings to the tables; these figures being approximate only.

(6) *Absorbing and Sampling Vessels.*—The exit gases were passed successively through one or more Drechsel's bottles containing standard H_2SO_4 to absorb ammonia, and through caustic soda to absorb hydrocyanic acid, before entering the water aspirator in which they were stored and measured. A stoppered cylinder filled with mercury or water was interposed between the acid and soda catches to sample the gases over the whole or any desired portion of the "run." A layer of oil was placed on the surface of the water in the aspirator to minimize absorption of carbon dioxide when water was used in place of soda in the exit catch before the aspirator. The amount of this constituent proved, however, to be much smaller than was expected, and the carbon equivalent of the carbon dioxide has little significance in the methane balance-sheets presented below.

(7) *Determination of Temperature.*—A platinum platinum-iridium couple was employed throughout the work, connected with a direct-reading Paul "single pivot galvanometer" with a range from 100° C. to 1400° C. In the earlier experiments, the thermo-junction was placed within the furnace tube enclosed in a silica tube of small bore. On two occasions, however, the junction was seriously attacked by the reacting gases, which entered through a fracture in the silica sheath, and it was found advisable in the later experiments to place the couple immediately above the furnace tube and in the furnace itself. As previously stated, thermo-junctions within and without the furnace tube gave practically identical readings on the galvanometer, proving that temperature conditions were extremely constant throughout the working region.

Analysis of Gases.

The analyses were carried out with a Stead's apparatus with mercury. Care was taken to apply necessary corrections for the volume of gas in the capillary connections. Oxygen was determined by absorption in pyrogallate, carbonic oxide by absorption in cuprous chloride, and combustible gases were exploded with excess of oxygen, followed by absorption of CO_2 in soda. The CO_2 so obtained was calculated as CH_4, and the H_2 reached by calculation, the nitrogen by difference. The presence of ethane, &c., was thus excluded from consideration. This is allowable in presenting a carbon balance-sheet; but the figures for CH_4 and H_2 presented in the tables afford no exact data for determining the relationship $\frac{CH_4}{H_2}$.

An important point arises: How far was the procedure effective in excluding adventitious air? It is impossible to speak with absolute certainty on this point in the absence of direct estimation of nitrogen. The nitrogen figures are difference figures, and have therefore to bear the brunt of the whole analysis. It is,

TABLE IV.—*Action of Wood Charcoal on Coal Gas. Yields of Ammonia and Hydrocyanic Acid per* 1000 *c.c. Coal Gas Used.*

Conditions.	720° C.	735° C.	745° C.	835° C.	935° C. Slow Rate.	935° C. Rapid Rate.
Experiment No.	10	5	9	6	12	13
Nitrogen . . . per cent. by volume in coal gas	5·1	3 9	5·7	6·0	3·5	4·6
Rate of flow (moist gas) . . c.c. per minute	55·0	39·0	44·0	38·0	71·0	145·0
Aqueous vapour . . . gramme	0·360	*Nil*	0·110	*Nil*	0·015	0·012
Products—						
Ammonia . . . gramme	0·002	0·001	0·003	0·002	0·008	0·002
Hydrocyanic acid (as NH_3) ,,	*Nil*	*Nil*	*Nil*	*Nil*	0·c04	0·001
Total	0·002	0·001	0·003	0·002	0·012	0·003

nevertheless, believed that the apparatus employed was very free from blemish in respect of air leakage. The tube showed no signs of leakage on exhaustion; the rate of flow was exceedingly sensitive to changes of pressure at the inlet and exit ends of the apparatus; experiments Nos. 7 and 8 show extremely close agreement between the volumes and composition of inlet and outlet gases, when allowance is made for the oxidizing effect of contained oxygen; and, lastly, the carbon dioxide and nitrogen figures afford general support; though, as already stated, the latter are regarded with reserve.

Ammonia and Methane Balance-Sheets.

Methods of Calculation.—The ammonia entering the furnace tube (see under "Apparatus," item No. 4) is equated against the sum of the ammonia and hydrocyanic acid (calculated as NH_3) leaving the tube. The difference is taken to be "ammonia decomposed" into its elements thermally. No account is taken in such calculation of the ammonia produced by direct interaction of nitrogen and hydrogen in presence of carbon. The figures for "ammonia decomposed" presented in Tables V. and VI. are, therefore, in every case minimum figures. Results in Table IV. indicate that with the large volumes of gas employed—as much as 4000 c.c. in some experiments—the amount of ammonia thus contributed to the yield by direct interaction of nitrogen and hydrogen is by no means negligible, and that the figure "ammonia decomposed" would at high temperatures be substantially greater were it possible to exclude the ammonia and hydrocyanic acid derived from the nitrogen of the coal gas used, or possibly from traces of nitrogen present in wood charcoal itself when that material was employed as contact material. The wood charcoal, however, was very free from ash—only 1·7 per cent. (Table IIIB., No. 12); ammonia formed, 0·032 gramme; hydrocyanic acid (as NH_3), 0·016 gramme.

In the case of the methane balance we are equally unable to correct the figures presented for carbon contributed to the gases by interaction of the wood charcoal with ammonia, oxygen, or aqueous vapour. The figures "solid carbon (by difference)," in the case of this contact material, must also, therefore, be regarded as minimum figures.

It was felt to be beyond the scope of the present research to attempt to determine the relative parts played by gaseous and solid carbon in such reactions as we have been discussing. The results presented in the accompanying tables, however, afford abundant evidence that methane yields nascent carbon by thermal decomposition at temperatures far below those at which carbon will react, under the conditions of the experiments, either with ammonia or nitrogen to form hydrocyanic acid; but the results summarized do not permit us to say any more than this.

Analytical Results.

Tables IA. and IB.

Experiments Nos. 1 *to* 6.—*Action of Porcelain and Wood Charcoal on Dry Coal Gas.*

In these experiments, the volumes of gas used and the rates of flow were kept as constant as possible. For this end, the coal gas used in the experimental "run" at constant temperature was stored in a Winchester quart bottle holding approximately 2500 c.c., provided with rubber stopper and the necessary connections. The whole of this gas was sent through the furnace tube as soon as constant temperature conditions had been attained. Coal gas was used to drive out air, and while the furnace was heating up, was allowed to escape at the final water aspirator. The exit gases were passed through two Drechsel's bottles placed in sequence; the first containing 50 c.c. of N/10 H_2SO_4, the second 25 c.c. of distilled water, thence to a water aspirator. A bye-pass placed between the two bottles enabled the gases to be continuously sampled over the whole "run" by a stoppered mercury cylinder. Hydrocyanic acid dissolves so completely in water when present in small amount, that the use of caustic soda was dispensed with here.

Table IA. shows for each experiment the volume of coal gas used (0° C., 760 mm.); its composition per 100 volumes before and after passing through the tube; the duration of the experiment;* the rate of flow of the inlet gas; the increase in volume of the latter per 100 volumes (dry, at 0° C., 760 mm.); and the number of minutes taken by the gas in passing through the heated tube.

Table IB. shows for each experiment the weight of marsh gas entering the tube (calculated as grammes of carbon); and the distribution of the products per 100 parts of the same by weight, calculated on the assumption that the decrease in weight of methane due to passing through the tube is due to its conversion into other forms—by oxidation to carbonic oxide and carbonic acid, by interaction with nitrogen to hydrocyanic acid, and by thermal decomposition to "solid carbon (by difference)." As already stated, no account is taken in the methane balance of any carbon contributed to the gaseous mixture by interaction of the constituent gases with wood charcoal itself.

Tables IIA. and IIB.

Experiments Nos. 7 *to* 10.—*Action of Porcelain and Wood Charcoal on Moist Coal Gas.*

In these experiments, the apparatus used and the procedure followed were those described in the experiments on dry coal gas, with the necessary replacement at the inlet end of a drying by a water-saturation system.

In Table IIA., the total volume of gas entering the tube—from which the "rate of flow" is calculated—is the combined volumes of coal gas and aqueous vapour, both measured at 0° C., 760 mm. On the other hand, no account is taken in the figure "increase in volume" of any aqueous vapour entering or leaving the tube. This figure, as before, denotes the increase in volume of the inlet coal gas per 100 volumes (dry, 0° C., 760 mm.).

Table IIB. shows for each experiment the weight of aqueous vapour entering the tube with the inlet gas, the distribution of the products derived from the methane, and the weight of ammonia produced.

Tables IIIA. and IIIB.

Hydrocyanic Acid; its Stability in Presence of Wood Charcoal with Moist Coal Gas as Diluent.

A measured volume of coal gas saturated with aqueous vapour at atmospheric temperature was passed through a tube packed with wood charcoal at a temperature of 935° C. The exit gases were passed successively through two Drechsel's bottles, the first containing 50 c.c. of N/10 H_2SO_4, the second 25 c.c. of N. potash, thence to a water aspirator, where they were measured and sampled. No account was taken of the carbonic acid produced in these experiments. The figures for "solid carbon" are slightly high in consequence; they include carbon oxidized to carbonic acid. In experiment No. 11, 53 c.c. of hydrocyanic acid were admitted with the inlet gas; in experiments Nos. 12 and 13, none.

In Table IIIB., a methane balance is presented for each experiment, calculated in the usual way. The figure "CH_4 as cyanide, 0·5 per cent." (No. 11), denotes the increase in hydrocyanic acid due to passing through the tube, calculated per 100 parts of carbon as methane entering; the calculation, as before, being based on the assumption that gaseous carbon (methane) alone takes part in reactions within the tube.

Table IV.

Action of Wood Charcoal on Coal Gas, Dry and Moist.—Yields of Ammonia and Hydrocyanic Acid.

In Table IV., the yields of hydrocyanic acid and of ammonia per 1000 c.c. of coal gas entering (0° C., 760 mm.) at various temperatures and rates of flow are brought together for convenience of reference. The results are approximate only, as no account is taken of the ammonia and hydrocyanic acid produced while the furnace tube was being heated up in a slow current of coal gas; the exit gases escaping through the acid and the soda catch-vessels during the whole of this period.

Tables VA. and VB., VIA. and VIB.

Influence of Temperature on Interaction of Methane and Ammonia.

In these experiments, measured volumes of coal gas, saturated with aqueous vapour at atmospheric temperature, and of dry ammonia gas (95 to 98 per cent. NH_3) were conducted in two regulated streams to a water-jacketed mixing-flask, and thence to a furnace tube packed with porcelain or wood charcoal. The supply of ammonia was turned on within two minutes of attaining constant temperature conditions and starting the inlet coal gas and exit water aspirator. It was shut off five to ten minutes before the coal gas, to enable the ammonia in the mixing-flask to be displaced and carried forward through the furnace tube to the catch-vessels beyond before the end of the experiment.

* The expression "duration of experiment" denotes here and elsewhere in this research the number of minutes occupied in the experimental "run," measured from the moment when constant temperature conditions were attained to the moment when the supply of inlet gas was shut off and the water aspirator stopped; and the expression "coal gas used" denotes the volume of inlet gas used within such period.

Table Va.—*Influence of Temperature on the Interaction of Methane and Ammonia (Slow Rate of Flow).*
[Col. (*a*), gas entering tube; col. (*b*), gas leaving tube.]

0° C. 760 mm.	Porcelain (Light Grey).						Wood Charcoal.							
	310 c.c., 270 Grammes.				230 c.c., 200 Grammes.		270 c.c., 80 Grammes.				230 c.c., 68 Grammes.			
	780° C.		800° C.		915° C.		755° C.		770° C.		805° C.		930° C.	
Experiment No.	14 (*a*)	(*b*)	15 (*a*)	(*b*)	16 (*a*)	(*b*)	17 (*a*)	(*b*)	18 (*a*)	(*b*)	19 (*a*)	(*b*)	20 (*a*)	(*b*)
Gas used (excluding NH_3), dry . . . c.c.	4970	5120	4865	5545	3855	5985	4630	5760	4540	5620	3780	4335	3710	5940
Per 100 volumes—														
CO_2	..	0·1	0·1	0·2	0·2	0·1	0·3	0·8	0·1	0·4	0·1	0·4	0·2	0·2
O	0·8	0·2	0·8	..	0·4	0·1	0·6	0·2	0·8	0·1	0·5	0·1	0·6	0·1
CO	12·1	12·3	2·4	2·6	20·1	17·6	15·0	13·2	10·9	11·3	13·3	12·9	19·9	14·6
CH_4	31·5	27·8	86·3	74·3	26·1	5·6	29·1	16·4	40·9	18·8	31·3	22·1	25·7	4·1
H	49·6	50·6	8·9	18·4	50·0	68·6	48·9	63·1	41·2	64·3	48·4	57·0	51·3	74·7
N	6·0	9·0	1·5	4·6	3·2	8·0	6·1	6·8	6·1	5·1	6·4	7·5	2·3	6·3
	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
Aqueous vapour . . c.c.	127	..	118	..	70	..	135	..	132	..	56	..	65	..
Ammonia (pure dry) . ,,	444	..	448	..	510	..	474	..	*Nil*	..	477	..	467	..
Duration of experiment minutes	64	..	58	..	68	..	64	..	65	..	46	..	65	..
Rate of flow (moist gas + NH_3) . c.c. per minute	87	..	94	..	65	..	82	..	72	..	94	..	66	..
Increase in volume, per cent. of dry gas entering (excluding NH_3)	..	3·0	..	11·9	..	55·2	..	24·4	..	23·8	..	14·7	..	60·1

Table Vb.—*Distribution of Products, Ammonia, and Methane (Slow Rate of Flow).*

—	Porcelain (Light Grey).			Wood Charcoal.			
	780° C.	800° C.	915° C.	755° C.	770° C.	805° C.	930° C.
Experiment No.	14	15	16	17	18	19	20
Aqueous vapour. . . . . . gramme	0·102	0·095	0·056	0·108	0·106	0·056	0·052
Ammonia balance—							
NH_3 entering . . . . . gramme	0·338	0·341	0·389	0·361	*Nil*	0·363	0·356
,, products, per cent.—							
NH_3 undecomposed	55·0	58·4	1·0	41·0	..	67·8	5·9
,, as hydrocyanic acid	3·3	2·6	*Nil*	*Nil*	..	10·7	0·3
,, dissociated (by difference)	41·7	39·0	99·0	59·0	..	21·5	93·8
	100·0	100·0	100·0	100·0	..	100·0	100·0
Methane balance—							
CH_4 entering as carbon . . . . gramme	0·842	2·326	0·541	0·725	0·999	0·636	0·512
,, Products, per cent.—							
CH_4 undecomposed	91·0	96·2	33·5	70·1	56·9	81·0	25·6
Oxidized to CO + CO_2	2·0	0·7	27·3	7·4	8·6	6·0	14·0
As hydrocyanic acid	1·0	0·3	*Nil*	*Nil*	*Nil*	4·2	Trace
As solid carbon (by difference)	6·0	2·8	39·2	22·5	34·5	8·8	60·4
	100·0	100·0	100·0	100·0	100·0	100·0	100·0

The exit gases passed successively through two Drechsel's bottles charged respectively with 40 c.c. of N/2 H_2SO_4 and 25 c.c. of N/5 H_2SO_4, and a Woulfe bottle containing 25 c.c. of N/2 NaOH, and thence to a water aspirator, where they were measured and sampled. A stoppered water cylinder was placed between the second acid and soda catches, to enable the gases to be sampled over 15 minutes during the central period of each "run." Coal gas used to expel air from the apparatus and while constant temperature conditions were being attained was allowed to escape at the final water aspirator.

In Tables Va. and VIa., as already explained, the figures denoting volumes of gas entering and leaving the tube, and increase in volume, relate to gases measured after a constant temperature had been attained. The rates of flow are based on the total volume of combined gas entering; coal gas, aqueous vapour, and ammonia (including the small amount of air associated therewith) are all measured at 0° C., 760 mm. In Tables Va. and Vb. are grouped the results conducted at "slow rates of flow"—65 c.c. to 94 c.c. per minute; and in Tables VIa. and VIb., similar results obtained at "rapid rates of flow"—188 c.c. to 202 c.c. per minute.

Conclusions.

Tables Ia. and Ib.

Action of Porcelain and Wood Charcoal on Dry Coal Gas.

Wood charcoal has a marked thermal effect on dry coal gas below 750° C. This effect rapidly increases with rise of temperature. Thus, at 735° C. (No. 5), solid carbon 39·6 per cent.; at 835° C. (No. 6), solid carbon 60·9 per cent. Traces of ammonia are produced, but no hydrocyanic acid below 835° C.

Porcelain at 770° C. has no effect on dry coal gas, either oxidizing or thermal (No. 4). Above 850° C., both effects are strongly marked. With white unused porcelain, the oxidizing effect predominates; with dark grey porcelain, after repeated use, the thermal. Thus—

White porcelain.—900° C. (No. 1), CH_4 oxidized, 36·6 per cent.; solid carbon, 14 per cent.

Dark grey porcelain.—870° C. (No. 3), CH_4 oxidized, 19·1 per cent.; solid carbon, 46·2 per cent.

But the thermal effect is markedly less than with wood charcoal. Thus—

Wood charcoal.—835° C. (No. 6), solid carbon, 60·9 per cent.

Ammonia was not estimated in experiments Nos. 1 to 4 with porcelain. No hydrocyanic acid was produced at 770° C., 860° C., 870° C. It was not looked for at 900° C., the oxidation effect on methane being so marked. The results generally indicate that methane suffers thermal decomposition at temperatures below that at which carbon is capable of reacting with nitrogen to form hydrocyanic acid.

Tables IIa. and IIb.

Action of Porcelain and Wood Charcoal on Moist Coal Gas.

Porcelain below 765° C. has no appreciable effect on moist coal gas, either oxidizing or thermal (Nos. 7 and 8).

In addition to the marked thermal effect that characterizes the action of wood charcoal on dry coal gas an oxidizing effect is noticeable with the moist gas, the product of such action being mainly carbonic oxide. But the action of moisture is partial only at the comparatively low temperature attained (745° C.), and the aqueous vapour at the same time acts as a protective both to the methane and ammonia; the figures for "solid carbon" showing marked reduction, and those for ammonia marked increase, over the corresponding figures for dry coal gas. Thus—

Dry, at 735° C. (No. 5)—methane decomposed—	Per Cent.	Moist, at 745° C. (No. 9)—methane decomposed—	Per Cent.
Oxidized . . .	3·0	Oxidized . . .	20·2
To solid carbon .	39·6	To solid carbon .	27·5
Total	42·6	Total	47·7

Had the aqueous vapour admitted (0·255 gramme) completely interacted with solid or gaseous carbon, the figure 20·2 per cent. would have been greatly exceeded. Thus: (No. 9) Carbon as CH_4 oxidized to CO_2, 3·5 per cent. (equivalent to 7 per cent. carbon as CO); CO, 16·7 per cent.—total (as CO) 23·7 per cent. 0·255 gramme of H_2O is equivalent to $\frac{12}{18} \times 0·255$ gramme carbon (as CO). Total methane entering, as carbon, 0·371 gramme. Hence, 0·255 gramme H_2O should oxidize—

$$\frac{12}{18} \times 0·255 \times \frac{100}{0·371} \text{ p. ct. methane entering} = 45·8 \text{ p. ct.}$$

Table VIa.—*Influence of Temperature on the Interaction of Methane and Ammonia (Rapid Rate of Flow).*

[Col. (*a*), gas entering tube; col. (*b*), gas leaving tube.]

0° C., 760 mm.	Wood Charcoal. Volume, 230 c.c.; Weight, 68 Grammes.					
	805° C.		855° C.		905° C.	
Experiment No.	21 (*a*)	(*b*)	22 (*a*)	(*b*)	23 (*a*)	(*b*)
Gas used (excluding NH_3) dry . . c.c.	4495	4780	4485	5485	4130	5840
Per 100 volumes—						
CO_2	0·1	0·3	0·1	0·3	..	0·2
O	1·2	0·2	1·1	0·2	0·6	0·2
CO	20 9	21·2	18·3	17·6	17·9	15·0
CH_4	23·7	19·3	26·7	15·4	27·8	8·8
H	46·4	51·3	49·4	60·2	49·5	69·3
N	7·7	7·7	4·4	6·3	4·2	6·5
	100·0	100·0	100·0	100·0	100·0	100·0
Aqueous vapour . . . c.c.	76	..	72	..	78	..
Ammonia (pure, dry) . . . ,,	356	..	482	..	481	..
Duration of experiment . . . min.	25	..	25	..	25	..
Rate of flow . . . c.c. per min.	197	..	202	..	188	..
Increase in volume per cent. of dry gas entering (excluding NH_3)	..	6·3	..	22·3	..	41·5

Table VIb.—*Distribution of Products, Ammonia, and Methane (Rapid Rate of Flow).*

—	Wood Charcoal.		
	805° C.	855° C.	905° C
Experiment No.	21	22	23
Aqueous vapour . . . gramme	0·061	0·058	0·062
Ammonia balance—			
NH_3 entering . . . gramme	0·272	0·367	0·366
,, products, per cent.—			
NH_3 undecomposed	84·6	44·4	23·5
,, as hydrocyanic acid	9·2	19·7	10·1
,, dissociated (by diff.)	6·2	35·9	66·4
	100·0	100·0	100·0
Methane balance—			
CH_4 entering, calculated as C. . gramme	0·572	0·644	0·617
Products, per cent.—			
CH_4 undecomposed	86·7	70·5	44·7
Oxidized to $CO + CO_2$	8·1	13·0	12·8
As hydrocyanic acid	3·1	7·9	4·2
As solid carbon (by difference)	2·1	8·6	38·3
	100·0	100·0	100·0

The oxidizing effect of aqueous vapour on methane, as well as on illuminants, has an important bearing on the economy of carbonization when steam is admitted, as in the Dessau intermittent vertical retort, towards the close of the carbonization process; one of the objects of forming water gas thereby being to assist in the rapid removal of the products of distillation.* But the question is beyond the scope of the present research.

Tables IIIa. and IIIb.

Hydrocyanic Acid; its Stability in Presence of Wood Charcoal.

Results show that hydrocyanic acid is stable at 935° C. in presence of wood charcoal and with moist coal gas as diluent; and, further, that traces of hydrocyanic acid are formed under the observed conditions—a conclusion confirmed by the results of experiments Nos. 12 and 13. Thus, in No. 11, 53 c.c. of hydrocyanic acid gas were sent into the tube, and 58 c.c. were obtained at the exit. It is interesting to observe that ammonia is also produced in amount exceeding that of the hydrocyanic acid. We know that ammonia itself reacts with carbon to form hydrocyanic acid under the observed conditions (see Tables V., VI.). It is probable, therefore, that the hydrocyanic acid obtained in experiments Nos. 11, 12, and 13, was a secondary product produced by interaction of the primary product, ammonia, with carbon, derived either from thermal decomposition of the methane or from the wood charcoal employed as contact material. This view receives confirmation from the fact that conditions which favour the formation of hydrocyanic acid when coal gas alone is passed over wood charcoal—viz., slow rate of flow and high temperature—are also favourable to the formation of ammonia (see Table IV.).

Table IV.

Action of Wood Charcoal on Coal Gas.—Yields of Ammonia and Hydrocyanic Acid.

Ammonia is produced at all temperatures between 720° C. and 935° C. Its formation is favoured by high temperature and reduced rate of flow. Thus—

At 835° C. (No. 6), rate of flow, 38 c.c. per minute; yield per 1000 c.c., 0·002 gramme NH_3.

At 935° C. (No. 12), rate of flow, 71 c.c. per minute; yield per 1000 c.c., 0·008 gramme NH_3.

At 935° C. (No. 13), rate of flow, 145 c.c. per minute; yield per 1000 c.c., 0·002 gramme NH_3.

Hydrocyanic acid, on the other hand, is not produced in appreciable amount under the conditions of the experiment by direct interaction of nitrogen and carbon below 835° C. Its formation is favoured by high temperature and reduced rate of flow.

Tables Va. and Vb.; VIa. and VIb.

Influence of Temperature on Interaction of Methane and Ammonia.

Porcelain.—Below 800° C., oxidization and thermal effects on methane are insignificant. Hydrocyanic acid is produced, but in small amount. Ammonia survives in large proportion. Above 900° C., oxidization and thermal effects are marked. Hydrocyanic acid, if produced at slow rate of flow, is entirely destroyed. Ammonia, likewise, is practically completely dissociated into its elements. Thus—

At 800° C. (Table Vb., Experiment No. 15)—
Methane decomposed—

	Per Cent.
By oxidization	0·7
To solid carbon	2·8
Total	3·5
Ammonia converted into hydrocyanic acid	2·6
Ammonia dissociated into its elements	39·0

* *Vide* Dr. Colman, "Journal," Vol. CI., p. 683.

At 915° C. (Table Vb., Experiment No. 16)—
Methane decomposed—

	Per Cent.
By oxidization	27·3
To solid carbon	39·2
Total	66·5
Ammonia converted into hydrocyanic acid	*Nil.*
Ammonia dissociated into its elements	99·0

Wood Charcoal.—At 755° C. (slow rate of flow), the thermal effect on methane is marked; but no hydrocyanic acid is produced, although conditions are favourable to its formation, both in respect to survival of ammonia and amount of solid carbon formed. (See experiment No. 17, Table Vb.) At 805° C., hydrocyanic acid makes its appearance; but the yield is but slightly affected by reducing the rate of flow. Thus—

Slow rate of flow, 94 c.c. per minute (Table Vb., No. 19), NH_3 per cent. as HCy, 10·7.

Rapid rate of flow, 197 c.c. per minute (Table VIb., No. 21), NH_3 per cent. as HCy, 9·2.

Above 900° C., on the other hand, rate of flow has a profound effect upon the yield. Thus—

Rate of flow 66 c.c. per minute, at 930° C. (Table Vb., No. 20), NH_3 per cent. as HCy, 0·3.

Rate of flow 188 c.c. per minute, at 905° C. (Table VIb., No. 23), NH_3 per cent. as HCy, 10·1.

The critical temperature for the formation of hydrocyanic acid is, therefore, considered to lie between 755° C. and 805° C. The reduced yield at the slower rate is attributed to the more rapid dissociation of ammonia into its elements, as the results presented in Table IIIb. show that hydrocyanic once produced is stable at a temperature of 935° C. Thus—

Slow rate of flow, at 930° C. (No. 20), NH_3 as HCy, 0·3 per cent.; NH_3 dissociated, 93·8 per cent.

Rapid rate of flow, at 905° C. (No. 23), NH_3 as HCy, 10·1 per cent.; NH_3 dissociated, 66·4 per cent.

The balance of ammonia surviving in experiment No. 20 (5·9 per cent.) is probably derived in large measure from the direct interaction of nitrogen and carbon. (See remarks on Tables III. and IV.)

The maximum yield of hydrocyanic acid under the conditions of the experiments was obtained at 855° C., rapid rate of flow 202 c.c. per minute, 19·7 per cent. of the ammonia used. (See Table VIb., No. 22.) In this experiment, 44·4 per cent. of the ammonia survived the passage through the tube. Had opportunity occurred for repeating the experiment at the same temperature, but at a reduced rate of flow, the yield of hydrocyanic acid would probably have reached an even higher figure.

Problems of Carbonization in Continuous Vertical Retorts.

It is hoped that the study of the preceding observations may prove of some practical aid in the elucidation of problems presented in the conduct of large-scale operations of carbonizing coal in continuous vertical retorts, where, in so many respects, marked differences appear in the liquid and gaseous products obtained as compared with carbonizing the same coal in horizontal retorts.

So far as the interests of the department are effected, the chief difference that appeared in the gas liquor analyses of 1907-8 lay in the increased ratio of hydrocyanic acid to ammonia in the liquors from the continuous vertical retort. The tars have not yet been so critically examined here. It is, however, already known that their distillation is not characterized by any increase

of difficulty from their special physical properties; indeed, the reverse is the case, in so far as the percentage of naphthalene is lessened—the tar presenting generally the character hitherto associated with low-temperature carbonization. The experimental work above described necessarily branched off as it proceeded to consideration of problems occurring in retort-house practice—viz., to the genesis of hydrocyanic acid and ammonia.

It has, unfortunately, not been possible to ascertain temperatures of the interior of the continuous vertical retort (Woodall-Duckham) at different levels. The difficulties attendant upon introducing the leads of an electrical pyrometer are considerable, since the mass of material in the retort is always moving downwards. The zone of maximum temperature attained varies in level by the operation of various factors—nature of coal, rate of feed, &c. As to some of the reactions that might be expected to take place in this zone, and to the possibilities of which these experiments point, I have made some remarks in the introduction to this record of work; but they can only be made tentatively and with reserve.

What is known is that the heat conveyed as sensible heat through the walls of the retort (the temperature in the flues is highest near the top, as this is where the gas and air are introduced and combustion takes place) rapidly becomes latent; being engaged on the work of distillation, so that only at a point about three-fifths of the length, reckoning downwards from the top, does the bulk of the material in process of carbonization attain its maximum temperature. Locally, near the wall of the retort, some material and some of the ascending gases suffer from exposure to excess of temperature, as is evidenced by the occurrence of gas carbon at various points. Professor Bone endorses as probable that such graphitic carbon results from decomposition of methane.

As regards the rate of flow of gases through the retort, and the time of contact of such gases, both with the walls of the retort and with the charge, no very direct comparison is possible between the results of laboratory and large-scale working, conditions being so different. But it may be of interest to state that the estimated time taken by the coal gas in passing through the tube used in the experiments recorded in Tables I. and II. is very similar to that calculated by Mr. Thomas Holgate from the carbonization figures for horizontal retorts supplied by Mr. John Bond in his paper read before the Institution of Gas Engineers in 1905; due allowance being made in both cases for the volume occupied by the packing. In Tables I. and II., times of contact are calculated for gases entering at 0° C., 760 mm. dry. Mr. Bond's figures, I am informed, relate to purified coal gas measured at 60° Fahr., 30 in. mercury.* Thus (Table IA., No. I)—

Volume of tube, 230 c.c., less packing (200 grammes) 130 c.c. = 100 c.c.

Volume of gas entering per minute, 0° C., 760 mm. = 38 c.c.

Hence the time of gas in the tube is 100 ÷ 38 = 2·6 minutes.

Mr. Holgate's estimate of the time of gas in the retort varies from 2·7 minutes at the start to 5·6 minutes at the end of the distillation. In experiments Nos. 11 to 13 (Table IIIA.), the time varied from 1·3 to 2·6 minutes; in Nos. 14 to 20 (Table VA.), from 0·8 to 2·1 minutes; and in Nos. 21 to 23 (Table VIA.), it approximated to 0·4 minute.

It has been increasingly evident, during the progress of this work, that to reach satisfactory and adequate conclusions, its scope needs extending. To continue the work, therefore, in this laboratory is felt to be impossible, since to carry out such experimental work satisfactorily great and continuous devotion of thought and energy is required. The conditions imposed by the claims of administrative official duties prevent this. We believe the results here presented to be as accurate as were possible of attainment under the disadvantages existing. Only in a technological institution like that at Carlsruhe, for so long under Dr. Bunte's able direction, or in the more recently established technical laboratory at the University of Leeds, under the guidance of Professor Bone, F.R.S., whose researches into the decomposition of gaseous hydrocarbons at high temperatures have placed him in such an exceptionally advantageous position for contributing data of value towards the scientific advancement of the gas industry, can such experimental work as this be properly undertaken.

In conclusion, I desire to recognize most warmly the zealous devotion of Mr. Linder throughout the research, for without his most able collaboration nothing would have been accomplished. If the work possesses value, the credit is really due to him.

* See "JOURNAL," Vol. CVI., p. 25.

Some interesting experiments are being conducted by the South Park Commissioners of Chicago in the lighting of the boulevards under their control. Several different types of lamps have been installed on temporary posts, in order that the comparative illuminating effect may be observed, and a determination made of how high the lamps should be hung, how far apart, and similar considerations. The lamps now under test (or about to be tested) include incandescent gas-lamps, enclosed arcs, magnetite arcs, flaming arcs, and incandescent tungsten lamps. The Commissioners hope to obtain valuable data, both as regards illumination and economy, from these trials; the latter being an important factor, as it is estimated that a million kilowatt-hours per annum will be required for the lighting of Grant Park alone.

DELETERIOUS EFFECTS OF BRIGHT LIGHT UPON THE EYES.

In "Science Progress" for July, Dr. J. H. Parsons, F.R.C.S. (Eng.), of University College, discusses, under the above title, the physiological causes of cataract and other eye ailments, as induced by powerful and unsuitable lights. From considerations based upon professional experience, and from special experiments with lights of definite intensity, including one of 3000-candle power, he says: "Hence, there is ample evidence to show that ultra-violet rays are deleterious to the eyes, not only in so far as the superficial structures are concerned, but also the deep; further, that prolonged action of weak doses is also to be avoided." All the more recent forms of electric lamp emit light rich in ultra-violet rays. This is specially true of arc lamps, in which the carbons are impregnated with metals or have a metal core. It is true in less, but still marked, degree of the various metallic filament electric lamps—the osram, the tantalum, &c.—as well as Nernst lamps.

The most powerful ultra-violet lamp is a mercury vapour lamp, in which the tube is made of quartz, and in which the mercury vapour is under pressure. By increasing the pressure, the spectrum obtained, instead of consisting of isolated lines or groups of lines, becomes continuous. Great heat, however, is developed by these lamps, necessitating their being cooled by means of a water-jacket. Dr. Parsons does not, however, consider moderate heat so injurious as the ultra-violet character of the light. Upon this point, he says: "It is difficult to imagine that heat can penetrate far into the eye when we consider that water is a bad conductor, and that the space between the cornea and the crystalline lens is filled with watery fluid. In fact, the lens is admirably protected from heat by a water bath. Cases, too, occur in which molten metal at an extremely high temperature is splashed into the eye without causing the development of cataract. If, therefore, such intense degrees of heat as those under consideration fail to produce deleterious effects upon the deeper structures of the eye, it is probable that we may with safety eliminate this factor as of any importance when we come to deal with sources of illumination in which the output of heat is incomparably less." Though Dr. Parsons does not make any specific comparison of gas and electricity as suitable sources of light, yet from the above quotations it is quite evident gas must occupy a high position when considered from the standpoint of the ophthalmist. The use of the new glass called "Euphos," as an envelope round lamps that emit ultra-violet light is explained and recommended.

It may help in understanding the bearing of Dr. Parsons' remarks to have in mind the following particulars of the quartz mercury lamp. By the use of fused quartz instead of glass for the tubes of mercury lamps, much greater voltages, with accompanying increase of efficiency, may be obtained. Mercury lamps mounted in glass and intended to take 110 volts are more than 1 metre long, and 3 to 4 centimetres in diameter. If mounted in quartz, a similar lamp would be only 8 centimetres long and 1 or 1½ centimetres in diameter. To begin with, the column of light fills the whole of the quartz tube, but after a short time contracts to a narrow band, the light having now a slightly yellow tinge. Owing to the high temperature reached, the mercury vapour is at about atmospheric pressure. With an electrical pressure of 174 volts and a current of 4·2 ampères, the horizontal candle power in a direction at right angles to the axis of the tube was 3080 Hefners. These numbers (given by the Reichsanstalt) indicate an efficiency of 0·24 watt per candle.

In contrast with such an artificial light may be given the intensity of the light received by the earth from the moon. Messrs. J. Stebbins and F. C. Brown found it at "full moon" to be about 0·23 candle. Full moon is approximately nine times as bright as the half moon; and there is distinct evidence of the moon being brighter between the first quarter and full than in the corresponding phase after maximum. Though this was at first surprising, it is evident, after some consideration, that there are more dark areas on the eastern than on the western half of the moon's disc towards us, and in particular the third or south-west quadrant is brightest of all.

Engineering Day at the Imperial International Exhibition.—Arrangements have been made for holding an Engineering Congress at the Great White City next Saturday, under the presidency of the Lord Mayor (Sir G. Wyatt Truscott). A Joint Organizing Committee has been formed, with Mr. W. Worby Beaumont, M.Inst.C.E., as Chairman, and Mr. W. Yorath Lewis as Hon. Secretary, for carrying out the details. The idea is to bring together the members of the numerous societies relating to engineering; and it appears to have been heartily approved by several sections of the engineering community. The programme consists of three parts—an itinerary of the engineering features of the exhibition, special demonstrations in the machinery hall and in the building on the west side of the Court of Honour, and lectures in the Congress Hall. One of the lectures will be by Mr. Percy R. Allen, on "Large Gas-Engines;" and it will be illustrated by lantern slides and a fine collection of photographs, drawings, and models. Mr. Dugald Clerk will preside. At five o'clock there will be a reception by the Lord Mayor; and in the evening a banquet in the hall of the Garden Club.

STEAM-DRIVEN PUMPING PLANT FOR DEEP WELLS AND BOREHOLES.

By Alfred Towler, M.I.Mech.E.

[Extracts from a Paper read before the Association of Water Engineers.]

At the summer meeting of the Association held in the Westminster Town Hall in the year 1897, the author had the honour of reading a paper on pumping machinery—dealing on that occasion with an engine located within suction distance of its water supply. This engine (Aubrey Street, Liverpool Corporation Water-Works) was the first of the triple-expansion, vertical, three-crank type built by the makers. But, as proving the value of the improvements which have resulted from the experience gained, it may be mentioned that whereas the mechanical efficiency of the engine referred to was 86·8 per cent. on a lift of 102 feet, and the duty was 134 million foot-pounds per 1000 lbs. of saturated steam at 133 lbs. pressure above atmosphere (based on pump displacement at a speed of 34 revolutions per minute), the best of the four engines supplied to the Rand Water Board, South Africa, and tested by Professor Orr in 1908, gave a mechanical efficiency of 93·4 per cent. on a lift of 960 feet, and a duty of 183 million foot-pounds per 1000 lbs. of steam at 183 lbs. pressure above atmosphere, superheated to 120° Fahr. (based on water actually delivered at a speed of 41 revolutions per minute), and which result constitutes the world's record for minimum steam consumption against water delivered.

Even allowing for the increased steam pressure, the great head pumped against, the number of revolutions, and the amount of superheat, the author ventures to submit that these results show very satisfactory progress during the interval of eleven years. He now proposes to consider the class of plant in which the engine is out of suction distance from the water to be pumped; the pumps therefore requiring to be so placed as to allow of the level of the water receding when pumped, and being located some distance below the engine. As this type of pump requires to be actuated from the engine by rods, the name "rod pump" is sometimes applied. Such pumps may be placed in either deep wells or boreholes, and whether a well or borehole, or a combination of the two, should be employed depends, or should depend, upon: (*a*) The depth the water is lowered by pumping; and (*b*) whether the strata yield water freely. Borehole pumps must be of the bucket type; whereas well pumps may be of the ram type if the water level does not vary more than 24 feet. The latter type of pump must be fixed above the highest water level; while the former can be immersed in the water to almost any depth. The author is of opinion that water for domestic use may be pumped from a maximum depth of 500 feet below the point of delivery in one lift from a well or borehole; but in current practice 300 feet is seldom exceeded. It will be understood that, the other conditions being equal, the wear and tear of working barrels and bucket rings varies in proportion to the effective lift. If the lift is considerable, it is usually advisable to break it into two lifts, either at the surface or immediately above the highest water level; the upper or forcing pump being either of the ram or piston type.

The speed of the pumping is governed by the clear waterway available, the type of valves employed, and the length of stroke adopted. In force pumps, the water-way is unlimited, as the valves are exterior to the working barrel. If the pump is of the piston type, the diameter of the working barrel determines in a measure the water-way; but if of the ram or plunger type, the pump-case and clack-box may be constructed so as to give any desired water-way. It will, therefore, be apparent that such pumps may be run at considerable speed, particularly where they are located near to the engine and coupled directly to it. On the other hand, in bucket pumps, such as are employed in deep wells and boreholes, the valves are either within, or are required to pass through, the working barrel; and the water-way being therefore limited, a slower speed and preferably a long stroke are necessitated.

The mechanics of pump construction being somewhat beyond the scope of this paper, the author will confine himself to indicating the principles which, in his opinion, affect the durability and efficiency of rod pumps. The valves should offer a minimum amount of resistance with a maximum water-way, and at the same time be sensitive, quiet in action, and remain tight when closed. With regard to bucket leakage, it is sometimes argued that no rings or packing are necessary if the bucket is deep, is turned a good fit in the working barrel, and furnished with a number of grooves; that rings are a nuisance and sometimes jam, and are liable to be damaged in passing the pump tree joints. In the author's opinion, it is not commercially practicable to make a working fit such as is in this case required. In bucket pumps furnished with a good form of packing, the author has found that an allowance of 5 per cent. for slip is ample to cover all leakage. In rod pumps the moving parts should descend by their own weight, and not have to be forced down, otherwise buckling of the rods will take place; and if the rods are sufficiently guided to prevent this, abnormal wear and tear will be caused.

The capacity of any pump in which the working barrel is immersed below the surface of the water is increased by the head on the under side of the suction valve or clack—that is, as the water more readily follows the bucket, it may be run at a greater speed. But the normal capacity of such pumps should be calculated without allowing for such "suction head;" and the water level should be taken from the centre of the working barrel. In what is sometimes called the "concertina" pump, two buckets are actuated in one working barrel by two sets of rods—one bucket ascending while the other is descending. It is claimed for this type of pump (1) that it has a greater capacity than a single-acting bucket pump, with the same diameter of working barrel; (2) that no live load is put upon the working barrel or pump trees; and (3) that a considerable saving in first cost is secured. The author is of opinion that no material increase in capacity can be obtained without abnormal wear and tear; and the great objection to this type of pump is the velocity of the water through the valves, due to the fact that the top bucket, when descending, meets an ascending column of water actuated by the lower bucket. The wear and tear of such pumps is often excessive, and slip is probably greater than in the older form, due to the running joints being doubled. With respect to first cost, the "concertina" type of bucket pump has a decided advantage as regards capacity for any given diameter of working barrel; but this, as previously pointed out, is an unfair basis.

Having shown, from the point of view of pump construction, the advantages of a long stroke, and consequently a smaller number of strokes per minute, the author next considered questions arising from the point of view of engine construction, and said that the least expensive, and, in his opinion, the most suitable, method of operating direct-acting long-stroke force and deep well or borehole pumps was by a non-rotative engine of the type of the Davey horizontal tandem triple-expansion surface condensing engine. When first cost was an important consideration, and coal was cheap, the non-rotative type of pumping engine took a great deal of beating. The improvements made in this type of pumping engine are shown by the following facts: A compound high duty pumping-engine made for, and tested by, Mr. Isaac Carr, M.Inst.C.E., at the Netherley Pumping-Station of the Widnes Water-Works in 1893, gave a duty of 109 million foot-pounds per 1000 lbs. of saturated steam at 75 lbs. pressure per square inch above atmosphere, calculated on pump displacement; the water horse power being 200. This was thought at the time to be a very excellent result; but last year (1908) a similar engine installed at the Stocks Well Pumping-Station belonging to the same Corporation, and tested by Mr. Carr, gave a duty of 143 million foot-pounds per 1000 lbs. of steam at 175 lbs. pressure above atmosphere, superheated 81° Fahr., calculated on pump displacement—the water horse power in this case being 410. The following is a description of this plant, and an account of its duty trial, with results in detail.

Stocks Well Extension of the Widnes Water-Works.

The pumping-engine was specified by Mr. Isaac Carr to pump 3 million gallons of water in 24 hours from a depth of 250 feet to the surface and thence into the service reservoir at Pex Hill, a distance of two miles, and 150 feet above the ground level at Stocks Well, *plus* an allowance for pipe friction of 100 feet, making a total lift of 500 feet; the working boiler pressure was to be 180 lbs. above atmosphere, superheated 50° Fahr. at the engine stop-valve.

The Contractors gave a guarantee of 128 million foot-pounds per 1008 lbs. of steam discharged from the air-pump and jackets; this duty being calculated on the pump displacement, and subject to a "premium and penalty clause,"

by which the makers agreed to forfeit £40 per million foot-pounds should the duty fall short of the amount guaranteed, and were to receive a premium of £20 per million foot-pounds should the guarantee be exceeded.

The contract for the steam-generating plant was let separately, and included: Two Lancashire boilers, 30 feet long by 8 feet in diameter; two Bolton's down-take superheaters, each having 47 square feet of heating surface; one of Carter's fuel economizers, with 32 pipes and 384 square feet of heating surface. The equipment of the pumping station included: One 10-ton hand travelling crane commanding the whole of the engine-house, a steam winch, together with 25-ton lifting tackle commanding both boreholes. The engine is of the horizontal, tandem, triple-expansion, surface condensing type. The force-pump is horizontal, of the double-acting piston type, and is worked from the tail rod of the low-pressure cylinder. The two borehole pumps are of the single-acting bucket type suspended in the boreholes, which are 22 feet apart. These pumps are actuated by connecting-rods operated from the high-pressure piston-rod by means of Davey's compensating lever motion; a high grade of expansion being thereby rendered possible.

The plant was started on May 6 last year, and was run continuously for a fortnight, pumping to waste until the water cleared. It was then run for another fortnight pumping into the mains, after which the temporary buckets were drawn and replaced by the permanent ones. The engine started under permanent work on June 3; on July 11 the preliminary test was made, and on July 13 the pumping-station was officially opened—the official duty test being made on Nov. 5. It was found, when the normal quantity of water was being pumped into the reservoir, that the friction in the delivery main was less than had been anticipated—namely, 57 feet; making a total working head on the force-pump of 207 feet. The rest level of the water in the boreholes was 70 feet; and when pumping at normal speed the water level receded to 122 feet below the surface. At the preliminary trial, a duty of 141 million foot-pounds per 1000 lbs. of steam at 168 lbs. pressure above atmosphere (superheated 50° Fahr.) at the engine stop-valve was obtained. This duty is based on the pump displacement, the steam used being measured from the air-pump discharge and the jacket drains.

The normal speed of the engine was 13·5 double strokes per minute; but it was found to work equally well at any speed between 12 and 18 double strokes. When it is working at normal speed, it will easily supply all the water required; so that the other pumping-station can be shut down, and used as a stand-by only. At the maximum rate of pumping, the level of water in the boreholes receded to 152 feet below the surface.

As the engine under normal conditions was somewhat lightly loaded, it was agreed that during the official test the delivery main should be throttled and the engine run at its maximum speed, so as to more nearly approximate to the conditions on which the guarantee was given—namely, a total lift of 500 feet. This offered no difficulty, and the fluctuations of pressure on the delivery water pressure-gauge were immaterial. No stroke recorder was available; but the length of stroke throughout the trial was kept under careful observation, and was found to be very uniform and as nearly as could be ascertained to the length specified.

Principal Dimensions.

Cylinders, 23 in., 38 in., and 60 in. diameter.
Two bucket (borehole) pumps, each 20 inches diameter.
Double-acting force-pump, 20 inches diameter.
Stroke of engine and pumps, 6 feet.
All piston rods 6 inches diameter, except the low-pressure cylinder back end and force-pump rod on the front side of piston, which were $4\frac{1}{2}$ inches in diameter.

Results of Twelve-Hour Trial—Nov. 5, 1908—Conducted by Mr. Isaac Carr, M.Inst.C.E.

Steam pressure at engine	175·5 lbs.
Temperature of steam at engine	459° Fahr.
Superheat	81·5° „
Vacuum in condenser	28·4 inches.
Steam pressure in H.P. receiver	44·6 lbs.
Steam pressure in I.P. receiver	0·76 „
Total number of double strokes	12,340
Double strokes per minute	17·138
Indicated H.P. of H P. cylinder	160·37
Indicated H.P. of I.P. cylinder	172·87
Indicated H.P. of L.P. cylinder	157·76
Total I.H.P. of engine	491
Borehole gauge (*less* 11·16 feet)	151·56 feet.
Delivery gauge (*plus* 13·87 feet)	347·27 „
Horse power of borehole pumps	128·08
Horse power of force pump	286·03
Horse power absorbed at gear	3·45
Total pump-horse-power (*net*)	410·66
Mechanical efficiency	83·63 per cent.
Air pump discharge	61,611 lbs.
Mean temperature of discharge	76·8° Fahr.
Jacket drains	6405 lbs.
Water supplied to vacuum spoiler	6 lbs.
Total steam used by engine	68,010 lbs.
Jacket steam per cent. of total	9·41 per cent.
Steam used per hour	5667·5
Steam used per I.H.P. per hour	11·42 lbs.
Steam used per P.H.P. per hour	13·8 lbs.
Duty of 1008 lbs. of steam	144,616,000 ft. lbs.
Duty of 1000 lbs. of steam	143,468,000 „ „

In conclusion, the author expressed his indebtedness and thanks to Mr. Carr for the following information received on the 2nd of May last, and said the members would no doubt join in congratulating Mr. Carr on obtaining such an abundant supply of good water so near the surface, and on the economies effected with the new pumping plant.

"We have this week taken out the buckets, and find that No. 1 borehole is silted up for a depth of 84 feet, the total depth being now 518 feet. The depth of No. 2 borehole is 678 feet; only 24 feet being silted up in this one. We take it the filling up with sand of No. 2 borehole has been prevented by a strong flow of water struck at the lower level.

"It is only necessary at present to run the plant for six days per week at normal speed; and when the plant is standing on Sundays, the rest water level is about 100 feet below the surface. When pumping, it recedes to 150 feet below the surface.

"The saving in the coal bill for the past twelve months is £1649 on the present contract price of 9s. 3d. per ton. This figure is about £650 in excess of the amount required to pay interest and sinking fund on the total outlay. As there is no pumping at Netherley, there is also a further saving in wages and maintenance charges of about £300 per annum.

"The whole of the water is now pumped by the new plant. The Netherley Station is shut down and only run occasionally to keep the machinery in order.

"The total capital outlay on the new extension was £16,600. The cost of the two boreholes was £2042. My estimate of the saving in the two boreholes as against the cost of sinking a well suitable for accommodating pumps to do the same work is £25,000. In making this estimate, I find myself face to face with some difficulty. In the first place, having regard to the existence of the number of boreholes at this station prior to the commencement of the work, together with the open nature of the strata, I am of opinion that it would have been a practical impossibility—I mean by this within the range of practical costs—to have sunk a well to such a depth at this station.

"The cost of pumping would itself have been such as would have rendered such a scheme prohibitive; so that had there been no other way of carrying out the work, another site would have been the only alternative. My estimate of the cost of a well, which would probably have had to have been not less than 16 feet diameter at the top and finishing up with not less than 10 feet at the bottom, would have cost, with the enormous temporary pumping, not less than the figure given. Of course, I am speaking of a well sunk in the new red sandstone formation of the heavy water-bearing quality such as is met with in this neighbourhood.

"Having regard to the fact that the Netherley Well, which is oval in shape, 12 feet by 9 feet, sunk only to a depth of 100 feet with a 24-inch borehole, a further depth of 200 feet, making a total depth from the surface of 300 feet, cost £8200, I think my estimate of £25,000 for a well 250 feet deep, having regard to the enormous extra pumping that would be required, is an extremely modest one.

"The cost per 1000 gallons of water delivered into Pex Hill Reservoir (working costs, without capital or sinking-fund charges) is 0·4d. The selling prices at Widnes are arranged on a sliding-scale, regulated by the quantity of water consumed, and are as follows: $4\frac{1}{4}$d per 1000 gallons to consumers up to 40 million gallons; $3\frac{1}{4}$d. per 1000 gallons for all consumed from 40 million to 50 million gallons; 2d. per 1000 gallons for all consumed above 50 million gallons.

"To many engineers the latter figure will appear to be a perfectly safe figure to offer to sell water at, as it is an exception for any water authority to have consumers taking so much per annum. As a matter of fact, however, in Widnes 28 per cent. of our total quantity used for manufacturing purposes is sold at 2d. per 1000 gallons.

"The charge for domestic supply is 4 per cent. on the net rateable value, inclusive of baths and water-closets."

Discussion.

Mr. F. J. Bancroft (Barnet) congratulated the author on the high duty obtained in the mechanical efficiency of 93·4

per cent. on a lift of 960 feet, and a duty of 183 million foot-pounds per 1000 lbs. of steam at 183 lbs. pressure. He thought this a very creditable performance. With respect to solid *v.* packed buckets, he had had experience of both solid buckets and those with rings, and was not prepared to condemn the former, as Mr. Towler had done. With reference to the respective merits of steam and gas driven plants, in a case he had in hand alternative tenders were invited, and it was ultimately determined, after careful consideration of the economy of steam and fuel, and also the cost of upkeep, to have steam-driven plant and direct-acting engines.

Mr. C. Liddell Simpson (London) described the paper as a very interesting one. He gathered that the author preferred large slow-running engines, driving pumps direct without the intervention of any sort of gear. Unfortunately, very often the efficiency of a large pumping installation was sacrificed in order to keep down the initial cost by having a cheaper design. Taking the case of the large horizontal engine described in the latter part of the paper, there was no doubt there would be difficulty in getting at the intermediate cylinders for examination, on account of the three cylinders being arranged in tandem. As to the steam distribution on the horizontal direct-acting engine working without a fly-wheel, it was very interesting to know that so good a steam distribution and economical result had been obtained. It must be attributed to the very heavy working parts, which had enabled the engine to cut off early, and at the same time maintain its stroke. The steam-jacket arrangement would have been better if it had been kept entirely separate, instead of only the high-pressure cylinder steam-jacket being kept separate. The "concertina" pump was mentioned in the paper. There were many cases where this form of deep-well pump was the only one that could be used. It took up little space, was self-balanced, and in the many examples of which he had experience this form of pump-work gave excellent results. On tests he had made, the slip had been found to be very small indeed; the highest recorded being 2½. It was well known that excellent results could be obtained with large engines which had small clearances, and made a fewer number of reciprocations.

Mr. H. Ashton Hill (Birmingham) said that the type of engine—horizontal, and requiring a long house—had been referred to by the author; but up to the present time he (Mr. Hill) had looked on this class of engine rather as being most suitable for borehole pumping. It seemed to lend itself to this work, in its motion, in the length of stroke, and in the free movement of the connecting-rods. He had recently put down such an engine; but instead of it being made direct-acting, he had added a fly-wheel to it. This met the view expressed by Mr. Simpson, who said he believed in large engines with long stroke and with small clearance; and no doubt this accounted for the considerable economy which they had obtained. The question of solid or packed buckets seemed to have assumed rather an important feature in the discussion. He did not believe in solid buckets, and would not have them in his works, except, perhaps, at the start of an engine, when they might possibly have sand to deal with. He knew that they would slip anything up to 30 per cent., or even more.

Mr. A. B. E. Blackburn (Sunderland) agreed that the direct-acting horizontal engine was the best in the case of pumping from deep boreholes. He was putting one down—a compound engine—and he could not say that he had yet been convinced that the greater economy of a triple-expansion engine really counterbalanced the increased initial outlay and upkeep involved in the extra length of building and the additional number of valves in the case of that engine. He did not quite understand the statement in the paper about an allowance being made for pipe friction of 100 feet, which seemed to him to be enormous.

Mr. J. J. Lackland (St. Helens) said the question of triple *v.* compound engines had, in course of time, proved to be very important; and triple-expansion engines had not yet shown conclusively that they were superior in regular work to compound engines for pumping. One reason for disappointment in pumping-engines was, he thought, that there was always a tendency—almost a certainty—that the engine would be designed too large for its ordinary work. He had had the pleasure of inspecting the new engine at Widnes; and he must congratulate the makers on it. In appearance, it was one of the finest engines he had seen; and it worked extremely smoothly and well, except in one small particular, which was not of much matter—namely, the slight knock which was caused by all the Corliss valves tripping together. It was always interesting to follow the performance of an engine over a series of years. In 1904 the duty of the Netherley engine at Widnes was given as 47½ million gallons, against 109 millions when the trials were first made. This showed a difference of two to one between regular work during twelve months, and the result in the trials.

Mr. J. Shaw (Boston) said he should like to refer to the "concertina" pump. The author stated in the paper that the great objection to this type of pump was the velocity of the water through the valves. He had had experience with such a pump—one of the first that was brought out—made by a Manchester firm in the early seventies. It was fixed in a well, where a set of three-throw pumps was already installed, and there was not room for a second set. The "concertina" pump was put in, with a peculiar motion, in which, by means of slots, the time of the bucket coming up was two-thirds of the revolution of the wheel. The bucket went down in half the time occupied in coming up. The suction water came twice as fast through the bucket when it was going down as the water travelled before the bucket when it was being brought up. There were two buckets in the one pipe, with a distance-piece between them. There were practically two pump-barrels; and it was claimed for it then—probably it would be now—that there was no stoppage or reversal of the water, but that it kept continually flowing in the one direction, and that by this arrangement the ascending bucket took the water before the other ceased to come down. He decided one day that he would endeavour to find out what was the difference in the pressure between the two buckets; and he came to the conclusion that what he might call the bugbear—the velocity of the water as a detriment to the pump—practically did not exist. There was certainly very little difference between the pressure when the upper bucket was going down and when the lower bucket was ascending; and there was practically no difference due to the head of the column of water in the pipe. There were some difficulties in regard to the pump, which had been removed in those constructed of late years; but he believed there were places in which the "concertina" pump would do good work at the present day.

Mr. Towler, in reply, said Mr. Bancroft had spoken of solid buckets. He (the speaker) would leave this for a moment, and return to it later on, when he was dealing with the same question which had been raised by one or two other speakers. Mr. Simpson had spoken of the difficulty of getting at the intermediate piston. There was really no difficulty in this particular design, because the piston-rod was made in three lengths, and each length was cottared up behind the piston, so that they could get out the whole of the parts. It was not at all a difficult operation. Mr. Simpson was very much in favour of solid buckets. He thought that to the views he had expressed in the paper in favour of buckets with rings he might add the words uttered by a very eminent statesman—Mr. Joseph Chamberlain: "What I have said, I have said." With regard to the "concertina" pump, he believed the greatest trouble that had occurred with the pump was in trying to force it. Some people had an idea that they could get as much water again out of a "concertina" pump as they could out of an ordinary one of equal bore. He did not for a moment mean to say that he was wedded to the older form of pump under all conditions; but he did say this—that a plain single-acting pump was, generally speaking, very much more efficient, and much more durable than "concertina" pumps as usually employed, because these pumps were, he thought, rather misused than otherwise. With respect to efficiency, he should like to explain that his experience was that an engine running at an ordinary speed of 40 revolutions per minute, would run, doing precisely the same work, more efficiently than the same engine going at 30 revolutions. He had proved this a number of times. Turning to Mr. Hill's remarks, he thought that the engine spoken of was built by his firm. As a rule, it was often said that they (the engine builders) obtained a good duty at the trial, and that then the engine became rather degenerate. The one to which Mr. Hill had referred was evidently an exception to the rule; and he did not see why any pumping-engine, produced by a good maker, should not come up, in ordinary running, to reasonably near the work done at the duty trial. Mr. Blackburn had spoken of the allowance of 100 feet for pipe friction. Of course, this friction was given by Mr. Carr in the specification which he issued to the different manufacturers to tender upon. They were not

responsible for that. Mr. Lackland was candid in his criticism; and he (Mr. Fowler) liked this. He mentioned the noise which the dash-pots made—all three falling at the same time. This was very objectionable. They did make a noise, as generally set; but they were fitted with shifting valves which could be set so that they made very little noise. Mr. Lackland also mentioned the question of triple *v.* compound engines. He thought that what he had already said would answer his question. With regard to an engine being too large for its work, there were two ways of looking at this. An engine might be too large, in the sense that it was able to pump twice the quantity of water it might have to do. Then there was the other way—that the head on the pumps might be very much less than had been originally intended. With steam-driven pumps, the water load might vary considerably without affecting the efficiency to a very great extent; but the engine was built for (say) 40 revolutions a minute, and it could only be worked down to 20. Of course, it could not be worked so economically at this rate as if it were running at its top speed. Then Mr. Lackland spoke about the reduced efficiency of engines in working, and referred to the Netherley and the Aubrey Street engines. He (Mr. Towler) was glad Mr. Lackland did mention these engines, for he could explain it to the members quite satisfactorily. Nearly all engine trials as they knew, were made on Welsh coal, or steam coal that was equivalent. In the case of the Netherley engine, it was taken on 1008 lbs. of steam equal to a coal with an actual evaporation of 9 to 1 in ordinary work. This was a very good kind of coal. After an engine had started, it suited the engineers very often to use local coal or common slack, which they could buy at a much cheaper rate. He thought the cost of the best Welsh coal, even at Liverpool, might be taken at 24s. or 26s. per ton. They might be using a coal of one-half or one-third of this value. So that, generally speaking, the figures of the ordinary working costs were on the cheapest coal that could be obtained. He hoped this explanation was quite clear and satisfactory. With regard to the Aubrey Street engine, he knew that its upkeep had been rather heavy; but he had it from the highest authority that the efficiency had been maintained. The engine was quite as efficient in steam consumption to-day as it was when it was first of all started eleven or twelve years ago. Mr. Shaw had spoken of the "concertina" pump. It was a physical impossibility to have one bucket going down and another coming up without an increase of speed of water through the buckets. If they were to run a pump of this sort, it might not be the top bucket which would give them trouble; it would probably be the bottom one. If they could not get water into the bucket, of course they could not pump; it was only a matter of degree. He thought anyone using a pump of this sort would find that a fast-running "concertina" pump would cost a good deal in the year.

The President (Mr. R. Askwith) said he was sure the members were much obliged to Mr. Towler for the clear way in which he illustrated his paper; and he ought to receive their thanks.

Daylight Saving Bill.—The Select Committee appointed to consider this Bill have issued their report, in which they recommend that, having regard to the great diversity of opinion existing upon the proposals of the promoters and to the grave doubts which have been expressed as to whether the objects of the measure can be attained by legislation without giving rise, in cases involving important interests, to serious inconvenience, the measure be not further proceeded with. They, however, record their appreciation of the efforts of those connected with the movement, and particularly of Mr. W. Willett, in the direction indicated in the title of the Bill, since, as a result, the hours of beginning and leaving off work have already been advanced in many cases.

Fruits of the Patent Act.—Mr. Harold Farmer, of the firm of Messrs. Leopold Farmer and Sons, through whose medium many of the foreign manufacturers have established themselves here under Mr. Lloyd-George's Patent Act, has given to a representative of the "Westminister Gazette" the following figures showing the great good already accomplished by the Act: Value of land and premises acquired, £130,650; amount expended upon the alterations, erection of buildings, and housing of working people, £180,750; amount expended upon plant, machinery, and the equipment of factories, £183,972—total capital outlay, £495,372. This is not all, for the value of annual assessment upon which local authorities will levy rates is £27,833. The foreign firms who have invested the above amount of capital in this country for the purpose of manufacturing articles they have patented under British law, number 24. Most of them are from Germany and America; but a few came from Holland and France.

RECENT ADVANCES IN PHYSICS.

The Seventy-Ninth Annual Meeting of the British Association for the Advancement of Science was opened in Winnipeg last Wednesday, when the President (Sir Joseph Thomson, Professor of Experimental Physics at Cambridge) delivered his Inaugural Address. In the course of it he dealt with the following subjects.

Recent Advances in Physics.

It has usually been the practice of the President of the Association to give some account of the progress made in the last few years in the branch of science which he has the honour to represent. The period which has elapsed since the Association last met in Canada has been one of almost unparalleled activity in many branches of physics, and many new and unsuspected properties of matter and electricity have been discovered. The history of this period affords a remarkable illustration of the effect which may be produced by a single discovery; for it is, I think, to the discovery of the Röntgen rays that we owe the rapidity of the progress which has recently been made in physics. A striking discovery like this acts much like the discovery of gold in a sparsely populated country; it attracts workers who come in the first place for the gold, but who may find that the country has other products, other charms, perhaps even more valuable than the gold itself. The country in which the gold was discovered in the case of the Röntgen rays was the department of physics dealing with the discharge of electricity through gases—a subject which, almost from the beginning of electrical science, had attracted a few enthusiastic workers, who felt convinced that the key to unlock the secret of electricity was to be found in a vacuum tube. Röntgen, in 1895, showed that when electricity passed through such a tube, the tube emitted rays which could pass through bodies opaque to ordinary light. It could, for example, pass through the flesh of the body and throw a shadow of the bones on a suitable screen. The fascination of this discovery attracted many workers to the subject of the discharge of electricity through gases, and led to great improvements in the instruments used in this type of research.

It is not, however, to the power of probing dark places, important though this is, that the influence of Röntgen rays on the progress of science has mainly been due. It is rather because these rays make gases, and, indeed, solids and liquids, through which they pass conductors of electricity. It is true that before the discovery of these rays other methods of making gases conductors were known; but none of these was so convenient for the purposes of accurate measurement. The study of gases exposed to Röntgen rays has revealed in such gases the presence of particles charged with electricity. Some of these particles are charged with positive, others with negative, electricity. The properties of these particles have been investigated. We know the charge they carry, the speed with which they move under an electric force, the rate at which the oppositely charged ones recombine; and these investigations have thrown a new light, not only on electricity, but also on the structure of matter. We know from these investigations that electricity, like matter, is molecular in structure, that just as a quantity of hydrogen is a collection of an immense number of small particles called molecules, so a charge of electricity is made up of a great number of small charges, each of a perfectly definite and known amount. Helmholtz said in 1880 that in his opinion the evidence in favour of the molecular constitution of electricity was even stronger than that in favour of the molecular constitution of matter. How much stronger is that evidence now, when we have measured the charge of the unit, and found it to be the same from whatever source the electricity is obtained. Nay, further, the molecular theory of matter is indebted to the molecular theory of electricity for the most accurate determination of its fundamental quantity—the number of molecules in any given quantity of an elementary substance.

The great advantage of the electrical methods for the study of the properties of matter is due to the fact that whenever a particle is electrified it is very easily identified, whereas an uncharged molecule is most elusive; and it is only when these are present in immense numbers that we are able to detect them. A very simple calculation will illustrate the difference in our power of detecting electrified and unelectrified molecules. The smallest quantity of unelectrified matter ever detected is probably that of neon, one of the inert gases of the atmosphere. Professor Strutt has shown that the amount of neon in 1-20th of a cubic centimetre of the air at ordinary pressures can be detected by the spectroscope. Sir William Ramsay estimates that the neon in the air only amounts to one part of neon in 100,000 parts of air; so that the neon in 1-20th of a cubic centimetre of air would only occupy, at atmospheric pressure, a volume of half-a-millionth of a cubic centimetre. When stated in this form, the quantity seems exceedingly small; but in this small volume there are about 10 million million molecules. The population of the earth is estimated at about 1500 millions; so that the smallest number of molecules of neon we can identify is about 7000 times the population of the earth. In other words, if we had no better test for the existence of a man than we have for that of an unelectrified molecule, we should come to the conclusion that the earth is uninhabited. Contrast this with our power of detecting electrified molecules. We can by the electrical method—even better by the cloud method of Mr. C. T. R. Wilson—detect the presence of three or four charged particles in a cubic centimetre.

Rutherford has shown that we can detect the presence of a single *a* particle. Now, the particle is a charged atom of helium. If this atom had been uncharged, we should have required more than a million million of them, instead of one, before we should have been able to detect them. We may, I think, conclude, since electrified particles can be studied with so much greater ease than unelectrified ones, that we shall obtain a knowledge of the ultimate structure of electricity before we arrive at a corresponding degree of certainty in regard to the structure of matter.

Structure of Electricity.

We have already made considerable progress in the task of discovering what the structure of electricity is. We have known for some time that of one kind of electricity—the negative; and a very interesting one it is. We know that negative electricity is made up of units, all of which are of the same kind; that these units are exceedingly small compared with even the smallest atom, for the mass of the unit is only 1-1700th part of the mass of an atom of hydrogen; that its radius is only 10^{-13} centimetre, and that these units—"corpuscles" as they have been called—can be obtained from all substances. The size of these corpuscles is on an altogether different scale from that of atoms; the volume of a corpuscle bears to that of the atom about the same relation as that of a speck of dust to the volume of this room. Under suitable conditions, they move at enormous speeds, which approach in some instances the velocity of light. The discovery of these corpuscles is an interesting example of the way Nature responds to the demands made upon her by mathematicians. Years before the discovery of corpuscles it had been shown by mathematical investigation that the mass of a body must be increased by a charge of electricity. This increase, however, is greater for small bodies than for large ones; and even bodies as small as atoms are hopelessly too large to show any appreciable effect. Thus the result seemed entirely academic. After a time corpuscles were discovered, and these are so much smaller than the atom that the increase in mass due to the charge becomes not merely appreciable, but so great that, as the experiments of Kaufmann and Bucherer have shown, the whole of the mass of the corpuscle arises from its charge.

We know a great deal about negative electricity. What do we know about positive electricity? Is positive electricity molecular in structure? Is it made up into units, each unit carrying a charge equal in magnitude, though opposite in sign, to that carried by a corpuscle? Does, or does not, this unit differ, in size and physical properties, very widely from the corpuscle? We know that by suitable processes we can get corpuscles out of any kind of matter, and that the corpuscles will be the same from whatever source they may be derived. Is a similar thing true for positive electricity? Can we get, for example, a positive unit from oxygen of the same kind as that we get from hydrogen? For my own part, I think the evidence is in favour of the view that we can, although the nature of the unit of positive electricity makes the proof much more difficult than for the negative unit. The investigations made on the unit of positive electricity show that it is of quite a different kind from the unit of negative, and that the mass of the negative unit is exceedingly small compared with any atom. The only positive units that up to the present have been detected are quite comparable in mass with the mass of an atom of hydrogen—in fact they seem equal to it. This makes it more difficult to be certain that the unit of positive electricity has been isolated, for we have to be on our guard against its being a much smaller body attached to the hydrogen atoms which happen to be present in the vessel.

If the positive units have a much greater mass than the negative ones, they ought not to be so easily deflected by magnetic forces when moving at equal speeds; and, in general, the insensibility of the positive particles to the influence of a magnet is very marked, though there are cases when the positive particles are much more readily deflected, and these have been interpreted as proving the existence of positive units comparable in mass with the negative ones. I have found, however, that in these cases the positive particles are moving very slowly, and that the ease with which they are deflected is due to the smallness of the velocity and not to that of the mass. It should, however, be noted that M. Jean Becquerel has observed in the absorption spectra of some minerals, and Professor Wood in the rotation of the plane of polarization by sodium vapour, effects which could be explained by the presence in the substances of positive units comparable in mass with corpuscles. This, however, is not the only explanation which can be given of these effects, and at present the smallest positive electrified particles of which we have direct experimental evidence have masses comparable with an atom of hydrogen.

Structure of Matter.

A knowledge of the mass and size of the two units of electricity, the positive and the negative, would give us the material for constructing what may be called a molecular theory of electricity and would be a starting-point for a theory of the structure of matter; for the most natural view to take, as a provisional hypothesis, is that matter is just a collection of positive and negative units of electricity, and that the forces which hold atoms and molecules together, the properties which differentiate one kind of matter from another, all have their origin in the electrical forces exerted by positive and negative units of electricity, grouped together in different ways in the atoms of the different elements. As it would seem that the units of positive and negative electricity are of very different sizes, we must regard matter as a mixture containing systems of very different types; one type corresponding to the small corpuscle, the other to the large positive unit. Since the energy associated with a given charge is greater the smaller the body on which the charge is concentrated, the energy stored up in the negative corpuscles will be far greater than that stored up by the positive. The amount of energy which is stored up in ordinary matter in the form of the electrostatic potential energy of its corpuscles is, I think, not generally realized.

All substances give out corpuscles, so that we may assume that each atom of a substance contains at least one corpuscle. From the size and the charge on the corpuscle, both of which are known, we find that each corpuscle has 8×10^{-7} ergs of energy. This is on the supposition that the usual expressions for the energy of a charged body hold when, as in the case of a corpuscle, the charge is reduced to one unit. Now, in one gramme of hydrogen there are about 6×10^{23} atoms; so if there is only one corpuscle in each atom, the energy due to the corpuscles in a gramme of hydrogen would be 48×10^{16} ergs, or 11×10^{9} calories. This is more than seven times the heat developed by a gramme of radium, or than that developed by the burning of 5 tons of coal. Thus we see that even ordinary matter contains enormous stores of energy. This energy is fortunately kept fast bound by the corpuscles; if at any time an appreciable fraction were to get free, the earth would explode and become a gaseous nebula.

The matter of which I have been speaking so far is the material which builds up the earth, the sun, and the stars—the matter studied by the chemist, and which he can represent by a formula. This matter occupies, however, but an insignificant fraction of the universe, it forms but minute islands in the great ocean of the ether, the substance with which the whole universe is filled.

The President proceeded to consider at length the subject of the ether, and then passed on to deal with radio-activity, the theory of radio-active change, and the source of radio-active energy, and the properties of radium; concluding his address as follows: The new discoveries made in physics in the last few years, and the ideas and potentialities suggested by them, have had an effect upon the workers in that subject akin to that produced in literature by the Renaissance. Enthusiasm has been quickened, and there is a hopeful, youthful, perhaps exuberant spirit abroad which leads men to make with confidence experiments which would have been thought fantastic twenty years ago. It has quite dispelled the pessimistic feeling, not uncommon at that time, that all the interesting things had been discovered, and all that was left was to alter a decimal or two in some physical constant. There never was any justification for this feeling; there never were any signs of an approach to finality in science. The sum of knowledge is at present, at any rate, a diverging, not a converging, series. As we conquer peak after peak, we see in front of us regions full of interest and beauty; but we do not see our goal, we do not see the horizon. In the distance tower still higher peaks, which will yield to those who ascend them still wider prospects, and deepen the feeling, whose truth is emphasized by every advance in science, that "Great are the works of the Lord."

CHEMISTRY AND ENGINEERING.

The President of the Chemistry Section of the British Association (Professor H. E. Armstrong), in the course of a long address, dealt with the following subjects of interest to our readers.

The Value of Chemistry.

The educational value of chemistry might be set very high. If properly taught, it would afford a means superior to all others of training faculties which in these days should be developed in every responsible citizen. No other subject lent itself so effectively as a means of developing the experimental attitude of mind—the attitude of working with a clearly conceived purpose to a desired end—which was so necessary to success in these days; and if care were taken to inculcate habits of neatness and precision and of absolute truthfulness, to teach what constituted evidence, the moral value of such work was incalculable. But to be effective it must be done under proper conditions, systematically; the time devoted to the work must be adequate. He would even advocate that the subject should be allowed to come before conventional geography and history and other unpractical subjects, assuming that the training was given in a practical way and with practical objects in view, not in the form of mere lessons learnt by rote. If taught in the form of mere didactic lessons, it was as worthless as any other subject as mental discipline.

When studied as a special object, chemistry, in particular, was one of the subjects which must be worked at long and persistently. Mere technical skill counted for so much, and so few seemed to possess the ability to become skilful chemists. In no other science did the element of understanding and an indefinable power of appreciating the character of changes as they occur, play so conspicuous a part; in no other science was the faculty of judgment more necessary. In practice, the chemist in works was constantly called upon to exercise his judgment—only too often to judge from appearances of conditions which were deep-seated. He was everywhere the works physician, in fact. It was therefore necessary that he should be highly trained and thoroughly versed in the art of inquiry. Much had been said and

written of late on the subject of technical training, which was of value as bringing out the various points of view. The problem was a very difficult one, owing to the great number of interests to be considered, and more especially the very uneven, and often inferior, quality of the material to be trained.

The great danger of specialized technical training was the tendency to make it too narrow. Success in practice depended not merely on knowledge of subject, but also, if not mainly, on the possession of certain human qualities which were not usually developed in the technical school and which could not be tested by examination. It was undeniable that in England, for many years past, chemistry had suffered from the recognized fact that there had been little money in it. Parents had been led, therefore, to prefer other careers for their sons; and the subject had not secured its due proportion of intelligence, and was suffering in consequence. Too many of those who had entered works had had neither the intelligence nor—to speak plainly—the presence and manners required to secure confidence. Men of gentlemanly bearing and instincts, who had received thorough training in science, were urgently needed at the present time in many of our manufacturing establishments to take the place of foremen of the old type, who had learnt all they knew in the works, and whose conceptions necessarily lacked breadth.

Chemistry and Engineering.

Another direction in which an approach of interests was required was between chemist and engineer. The latter had too long occupied a dominant position in many works, and in not a few cases had done his utmost to exclude the chemist—apparently fearing his competition. The gas industry perhaps afforded the most striking illustration of the effects of such a policy. On the engineering side, it had been carried to a high pitch of perfection; but on the chemical side it had ever fallen, year after year, to a lower state. The quality of coal gas was such, especially since the withdrawal of the sulphur clauses from the Acts of Parliament by which the industry was regulated, that gas was almost unusable. Had not chemists entirely unconnected with the gas industry vastly improved the methods of burning it, gas would long since have fallen into disuse. The iron industry was an even more striking case. The appliances were wonderful examples of constructive skill; but the engineer was clearly nonplussed when he sought to understand the processes he nominally controlled. The chemist had been kept so closely confined to his bench in the laboratory that he had had no proper opportunity of studying the processes of manufacture systematically. No systematic study of steel had yet been made. Considering the magnitude of the industry and its importance, our knowledge of the subject was phenomenally slight. What we did know of the relation of strength and structure to composition was due to the pioneer labours of the late Dr. Sorby—an amateur unconnected with the industry—and to a fruitful conjunction of the labours of engineers and chemists outside the works, who, in self-protection, had tested the materials before use.

In Germany, the chemist and the engineer had been placed on an equality and required to work together, with results which were altogether satisfactory. We needed to adopt a similar practice. Any attempt to fuse the two into one would meet with failure. They were called upon to work from different points of view. They needed to be in sympathy and to understand one another; but their work was complementary. They would be wise in Canada if they selected no small number of their abler students—young men of promise physically as well as intellectually—and trained them as chemists. Of late years attention had been called from every side to the inconsiderate manner in which raw materials, especially coal, iron, and wood, were being used up in all civilized countries. It was difficult to interest the public in such a subject, as few could appreciate the consequences, owing to the general ignorance of science and to the existence of an optimistic belief in the power of scientific discovery. But nothing would compensate for the exhaustion of coal and iron supplies. The chemist and engineer would be required to help in effecting economies by improving present methods of treatment.

Increase in the Cost of Mantles in Germany.—The Union of Incandescent Mantle Makers of Berlin have announced that, in consequence of the taxation of mantles which comes into force on the 1st of October, there has been such an enormous demand created for the time being that the manufacture is attended by largely increased expenditure, owing to the cost of raw materials having been increased and to the necessity of working overtime. The Union have decided to raise the price of mantles.

Water-Works Directory and Statistics for 1909-10.—We have received from Messrs. Hazell, Watson, and Viney, Limited, the above-named work. This is the twenty-eighth edition; and the Editor, in his preface, says every effort has been made to bring the volume up to date, and furnish the fullest and most reliable information. There is a considerable increase in the number of undertakings of which particulars (which are very full) are given; and the contents include, as before, a list of Associations of Water Engineers and an index of officials. In the preparation of the volume, the Editor had the support of the Association of Water Engineers, who appreciated the value of general information relative to the water undertakings of the country. The book is got up in the same style as its immediate predecessors; and it is published at 10s. 6d. net.

AMMONIA RECOVERY IN GAS-WORKS.

By J. S. Ungar, of Chicago.

[A Paper read before the Wisconsin Gas Association.]

There still seems to be doubt in the minds of some managers of medium-sized gas-works whether it pays to trouble with the recovery of the ammonia in gas liquor. It may be that these gentlemen believe the savings effected would not compensate for the time they would have to give to this new departure, or it may be that they have paid more attention to reports from gas-works that have had trouble with ammonia recovery, owing to poorly designed apparatus or to poor management, than to the many instances of successful operation. The manufacture of coal gas, unfortunately, is still much dependent upon the rough man with the shovel, who is willing to do jobs which the man better trained mentally refuses to undertake. Naturally, the manager hesitates to introduce new methods of procedure that necessitate greater attention to details on the part of his men, when he has trouble already in making them attend properly to their duties, and when his foreman may tell him that any change is going to cause trouble. Excepting the works where the design or the size of apparatus is inadequate or out of date, these troubles, however, are more imaginary than real. This is proved by the profits from ammonia recovery in gas-works gasifying less than 3000 tons of coal a year. Ammonia recovery also improves the quality of the gas, as generally it will be better condensed and washed, and thereby, besides the ammonia, also about one-eighth of the sulphuretted hydrogen and the carbonic acid are removed. In addition, an ill-smelling and destructive waste product becomes harmless and made to yield a profit.

Troubles attending ammonia recovery may be divided into: (1) Troubles converting all the ammonia in the gas into a liquor of sufficient strength for economical distillation; (2) trouble with distilling apparatus; (3) troubles of supervision.

Troubles in Generating and Washing.—Generally speaking, the conditions favouring a production of a fluid and merchantable tar also produce a high yield of ammonia from the coal; and when the tar is fluid there is no particular difficulty in working the hydraulic main without any addition of fresh water or special pumping to keep the main in good condition. High temperatures in the retorts, in connection with small charges, cause the well-known troubles, especially if the mains are small or not provided with easily accessible cleaning openings. When the tar is removed in large lumps or in irregular quantities, other liquid must be added to replace the quantities taken out; and in small gas-works without ammonia recovery, this is often done by adding large quantities of fresh water. As such practice would be inadmissible with ammonia recovery, the best method is to collect the liquor from the hydraulic main into a separate tank, pump it over again into the hydraulic main, and, if necessary, pass it through a cooler to get the temperature down. To pump the liquor from the condensers and scrubbers into the hydraulic main will cause loss of the volatile ammonia, owing to the high temperature prevailing in the mains.

In spite of the frequent assertion that employing any excessive seal is the cause of all the hydraulic main troubles, some gas-works and coke-ovens find many advantages with deep seals and corresponding vacuum, because thereby the gas is washed better, helping out the other condensing and washing apparatus and producing a more fluid tar.

There is no doubt that the rotary scrubber, from the gas maker's standpoint, is the best apparatus for the removal of ammonia after the gas has been cooled in the condensers. For reasons of operation, however, it is not suited for small works; and tower scrubbers are usually employed, preferably in connection with an immersion washer of some kind. To get out all the ammonia, and in order to get sufficiently strong liquor, two scrubbers are necessary, with fresh water only entering the last scrubber, and ammoniacal liquor pumped over and over again into the first scrubber. Three gallons of fresh water introduced per 1000 cubic feet of gas should be sufficient, with properly designed flushing and spraying arrangement; and these, with the hygroscopic water in the coal, estimated at (say) 1·6 gallons per 1000 cubic feet, and a yield of ammonia of 5 lbs. per ton, will yield a 5-oz. liquor equal to 1¼ per cent. of ammonia. This strength, however, may not be obtainable, owing to insufficient condensing and scrubbing apparatus, and it will pay to use more fresh water and get the liquor of (say) 1 per cent. strength. This will cause more steam to be used in the ammonia distillation—say a fourth more, compared with liquor of 1¼ per cent. But, owing to plenty of cheap fuel around coal-gas works, it is better to use more steam than to allow a large portion of the ammonia to escape.

Troubles with Distilling Apparatus.—Owing to the natural disinclination of managers of gas-works to complicate the process of ammonia recovery, only apparatus for making crude concentrated liquor will be considered. Ammonia concentration is a simple process, and can be worked almost automatically, if provision be made to introduce the weak liquor, the milk of lime, and the steam in constant and suitable quantities. Unfortunately, in order to diminish the first cost, or from lack of knowledge, these conditions are not obtained, with the result that the process becomes a source of annoyance and disappointment. The temperature of the vapours, before they enter the apparatus for final condensation into concentrated liquor, determines the percentage

of ammonia in the finished product; and, in order to keep this temperature at the desired degree, the thermostatic control has of late been attached to ammonia stills with beneficial results. However, if the weak liquor and the milk of lime yet remain but in imperfect control there will be corresponding irregularities in the steam supply—causing either loss of ammonia in the waste or excessive consumption of steam.

A regular supply of weak liquor can be obtained by a constant hydraulic head, either by keeping the feed-tank always full to overflowing, or else by interposing between it and the ammonia still an auxiliary tank controlled by a float. As a further precaution, and in order always to see the rate at which the still is working, one German manufacturer instals a meter, made in the form of a tilting tank underneath the tank with the float. Instead of a meter, good practice is to use two feed-tanks, one of which is emptied while the other is being filled.

A new method for supplying a regular feed of milk of lime in a concentrated form has lately been developed, in which the milk of lime is kept in a stirred condition and injected into the still by means of compressed air. The lime is first slaked in an open tank, and then poured into a tank that can be closed air-tight, and provided with perforated pipes in the bottom, through which the air enters. A vertical pipe, with its lower end open, conducts the milk of lime from the closed tank to a valve operated by the compressed air that has previously passed through the milk of lime. The air, acting on a rubber diaphragm, keeps the valve closed until the piston, in a dash-pot or cataract filled with oil, in its descent (caused by gravity), releases a lever that acts on a little air-valve, and permits the air behind the diaphragm to escape, thereby opening the main valve. Upon opening the piston, the cataract is raised again, the lever locked in its previous position, and the air again admitted against the diaphragm, with the result that the main valve closes, after having remained open for a few seconds, until after the descent of the piston in the cataract. The operation is then repeated. The time between the openings is regulated by a small valve allowing the oil in the cataract to bye-pass from bottom to top of the piston at varying speed. As the main valve, when opening, always discharges the same amount of milk of lime, the quantity of lime introduced into the still is regulated by changing the time-intervals between openings. Thus, the same size of valve can be used for a great many different sizes of stills. If the valve were omitted, and an attempt made to regulate by a small opening, it would soon clog up with lime.

As the air keeps the milk of lime constantly stirred; and as the air pressure will force the liquid through the pipe and the valve with a rush in a comparatively large quantity at a time, it is believed that no other method has been devised which will handle the milk of lime in such a concentrated form with equal reliability. It is safe to say that this device would deliver a milk of lime from six to fifteen times stronger than is at present the case at most gas-works. Besides, it will deliver the lime in suitable and perfectly controllable quantities, whereas ordinarily the lime is introduced hap-hazard and irregularly. Even with stills that are arranged for lime introduction, the operation is often so annoying that lime is dispensed with, or only attempts are made to give the still a little lime once in a while.

Lime for taking out the fixed ammonia should always be used in connection with ammonia distillation from gas liquor, as, in the first place, the so-called fixed ammonia, averaging about 15 per cent. of the total ammonia, is worth saving; and, in the second place, there will be less trouble with salting of the distillate, owing to the proportion of pure ammonia liberated by the lime. Consequently, the percentage of ammonia in the concentrate should be made higher before there would be any danger of salting.

The usual practice, on which the contracts between the gas companies and the ammonia refineries are made, is to ship a concentrate containing 15 per cent. of ammonia. It is claimed that a stronger distillate will cause losses in ammonia owing to evaporation, and that a 15 per cent. product is about the limit of strength that the gas companies can make. This may be all right where the distance to be shipped is comparatively short, though it would seem that a product containing 15 per cent. of ammonia and about the same amount of impurities in the shape of carbonic acid and sulphur, which must be removed by the refiners, would be less valuable per pound of ammonia than a product containing up to 25 per cent. ammonia with most of the impurities eliminated. When the distance becomes great, the freight that can be saved by making a stronger liquor is considerable. Thus, the freight of a 25 per cent. liquor is 40 per cent. less per unit of ammonia as compared with a 15 per cent. liquor; and the freight of a 20 per cent. liquor 25 per cent. less. The coke-oven concerns have long understood this, and have been shipping a stronger liquor; and abroad most new stills are contracted for with a provision that the liquor to be made may be 25 per cent. without salting. This is accomplished through a system of preheating the weak liquor in its descent in the distilling apparatus with the waste heat and other heat from the distillation column up to a certain temperature at which most of the carbonic acid and the sulphuretted hydrogen are liberated; whereas the warm liquor has still a property of retaining the bulk of the ammonia. These gases passing upward are washed by the descending weak liquor, whereby the ammonia is absorbed again, the acid gases escaping into the atmosphere. The process is not difficult, and causes but slight complication of apparatus. Previously the same effect was accomplished by washing the vapours from the still in lime water; but by the process above described this expense for lime is avoided.

The capacities of the stills in gallons of weak liquor per hour vary considerably according to the construction. For instance, a 6-feet diameter still has a capacity of 2200 gallons per hour; a 4-feet diameter still, 800 gallons; another 4-feet diameter still, only 300 gallons; a 40-inch diameter still, 780 gallons; a 36-inch diameter still, 270 gallons; a 24-inch diameter still, 110 gallons. The capacity can be increased by deeper seals of the hoods causing stronger boiling, and by a condenser at the top of the still, from which the condensate returns to the still, thereby, so to speak, drying the vapours, as the water condensed has but little capacity to retain any ammonia at that temperature.

Many complaints are heard that ammonia stills are soon destroyed by the action of the vapours in the upper part of the still. Owing to the high percentage of carbonic acid and other acid gases that destroy iron, the hot vapours have a special destroying effect on the pure iron, such as soft steel and wrought iron, but will also, in time, disintegrate cast iron.

If the acid gases are removed from the liquor before entering the still proper, this destruction would not take place, as the ammonia has but little effect on iron, for which reason such removal ought to take place. However, stills can be made more durable if iron is avoided in the upper part as much as possible, and therefore it is good practice to use coils of lead in the cooler and condenser, through which the vapours pass, rather than condensing the vapours in iron vessels, cooled with lead coils containing the cooling water. There is less danger of stoppages from deposit of salt in the iron vessels than in the lead coils; but with automatic temperature control there is very little danger of further stoppage, formerly the bugbear in the distillation of ammonia.

Troubles of Supervision.—An ammonia still of modern design, and provision being made for taking care automatically of the weak liquor supply, the milk of lime, the steam supply, and the waste, as explained previously, will do away with the difficulties of supervision as far as the distillation is concerned. A separate man to take charge of the still is, therefore, unnecessary; and beyond giving the man a little additional reward or premium to look after the ammonia recovery in addition to his other duties, there need be no extra outlay for labour in connection therewith. The testing of the liquor in a small works would be done by the superintendent or foreman; and after the apparatus has been used for some time, and the whole process has adjusted itself to normal conditions, there need be very few chemical tests, but only purely mechanical operations that do not require any extra skill.

DESTRUCTION OF A WATER-GAS PLANT FAN.

Dr. Leybold, of the Hamburg Gas-Works, reports, in a recent number of the "Journal für Gasbeleuchtung," on an accident which was brought to his notice last year, by which the fan of a blue water-gas plant was blown to pieces and a workman was severely injured. The blast main connecting the fan with the generator was about 40 feet in length and 14 inches diameter, and provided with a valve at the generator end. When the generator was in action, the return of gas to the blast main was prevented by maintaining the air pressure in the latter so that even if the valve was accidentally opened, or was not tight, no appreciable amount of gas would enter the main. There was also in front of the valve a small vent-pipe leading to the open. When the accident occurred, the operator wished to stop the manufacture of gas because the holder was then full. He closed the steam-valve, opened the gas outlet-valve and the intermediate valve, and moved the air-valve a little way up and down, in order to allow the gas which had collected in the apparatus and the connections to escape through the stack-valve. He called at the same time to the engine men to stop the engine. Two minutes later he went into the engine-room and saw bluish smoke escaping from the fan. He shouted to the two workmen to get out of the building as quickly as possible, and was going away himself, but an explosion ensued immediately which knocked the men down and shattered the fan into small pieces.

The cause of the accident appears to have been that the engine, and consequently the blower, were stopped too soon, so that the valve on the air-blast main remained open for a moment after the fan had ceased running, and the mixture of gas and air formed therein was ignited from the generator. In order to avoid a recurrence of the accident, orders have been given that the operator in charge of the manufacture of gas shall himself stop the fan after he has finished gas making. This will prevent the fan, which is in another room, being stopped too soon. There have also been made on the blast main two large openings closed with impervious canvas to serve as safety-valves. Dr. Leybold hopes that the explanation of the cause of this explosion may help to prevent similar accidents occurring in future.

The Key Engineering Company, Limited, of 4, Queen Victoria Street, E.C., have issued a calculator or slide-rule by means of which the profit or loss resulting from the installation of large gas-engines may be readily ascertained. Examples are given with the calculator to show its use.

RECIPE FOR MAKING OXIDE OF IRON.

In the course of a paper, on "The Preparation of Purifying Materials and the Purification of Gas," read by Mr. C. F. Farmer, a Superintendent in the service of the Austin (Texas) Gas Company, at the last annual meeting of the South-Western Electric and Gas Association, he gave the following recipe, which he said had given entire satisfaction, for making oxide of iron: To 20 lbs. of clean cast-iron borings (the finer the better), use one bushel of soft pine shavings, or sawdust for shallow boxes; spread the shavings in a thin layer, and sprinkle the borings evenly over them, wetting the mass as the layers are spread. Repeat these layers until the desired quantity is prepared. (Wetting with brine will hasten the operation.) Then, with shovels, turn the mass until it is thoroughly mixed; make a pile of it, and let it stand for 10 or 12 hours, when the oxide should be very hot; then turn it into another pile, wetting it down as before. Care should be taken not to get it too wet. This operation will have to be repeated every 12 hours for four or five days; then once in 24 hours should be sufficient, as the oxide now heats more slowly. When it does not heat after being turned, it should be spread in a thin layer, about 12 or 14 inches deep, and allowed to stand until wanted for the purifiers.

Mr. Farmer pointed out that new oxide will not purify as much gas when it is first used as it will after it has been worked a couple of times; and he said it should be watched very closely when in use. When it shows foul in the box, it should be taken out and heaped in a pile, which should begin to heat at once, and in 10 or 12 hours' time should be hot enough to burn one's hand if thrust into it. It should then be spread in layers 18 inches deep, left for 24 hours, then turned in layers 12 inches deep, and left until wanted again. Mr. Farmer added that, in making oxide, care should be taken not to leave any free iron in it, and not to let it come in contact with any wordwork, either in making or revivifying it, as it is liable to fire the oxide, char the wood, and ruin the oxide. Care should be taken to keep tar and oil from it, as both destroy its usefulness. In charging the purifiers with the oxide, it should be sprinkled with water to damp it, but should not be made too wet—just wet enough to stick together when squeezed in the hand, as too much wetting would cause it to cake and become hard in the boxes, making it very difficult to remove again when foul.

AMERICAN ILLUMINATING ENGINEERING SOCIETY.

The third annual convention of this Society will be held in the United Engineering Societies' Building, New York, from the 27th to the 29th of September. The proceedings will open on the afternoon of the first-named day with an address of welcome by Mr. T. Cummerford Martin, which will be responded to by Mr. Walton Clark. Then the President (Mr. W. H. Gartley) will deliver his address, at the close of which the reports of Committees will be presented; one being "On Nomenclature and Standards," by Dr. A. C. Humphreys, the Chairman. In the evening there will be a reception and concert. The following papers are being prepared for presentation and discussion:—

"Ethics of Illuminating Engineering," by Mr. E. L. Elliott.
"Some Notes on Illuminating Engineering Practice in Europe," by Mr. H. Thurston Owens.
"The Importance of Illuminometry in Practical Illuminating Engineering," by Mr. Norman MacBeth.
"Efficiency of Lighting Installations," by Mr. A. L. Eustace.
"Shades and Reflectors," by Dr. Louis Bell.
"The Design of Reflectors," by Mr. A. J. Sweet.
"Diffusing Mediums," by Mr. A. J. Marshall.
"Absorption and Diffusion of Various Forms of Glass Surfaces," by Mr. Basset Jones, jun.
"Factory and Mill Lighting," by Mr. L. B. Marks.
"The Photometric Laboratory of the United Gas Improvement Company," by Mr. C. O. Bond.
"The New Physical Laboratory of the National Electric Lamp Association," by Mr. E. B. Hyde.
"Modern Photometric Practice in an Incandescent Electric Lamp Factory," by Mr. Charles Deshler.
"The Problem of Heterochrome Photometry," by Mr. E. S. Millar.
"Description of a Demonstration Lighting Installation," by Mr. W. C. Morris.
"Discussion of the Efficiency of the Moore Light," by Messrs. Hyde, Woodwell, Sharp, and Millar.

The exhibition feature of the convention, which was so successfully introduced last year, will be extended in scope. The Committee have secured the use of a building situated about midway between Fifth Avenue and the Illuminating Engineering Societies' Building, admirably adapted for the purpose; and on it a historical and educational exhibit will be arranged under the direct auspices of the Exhibition Committee. In addition to this, there will be exhibits by the manufacturers of the various commercial types of electric and gas lamps, accessories, and fixtures. The exhibition will be especially valuable as containing a number of the latest developments in the production and utilization of light, which have not been heretofore publicly exhibited. It will be open to the public during the entire week of the meeting.

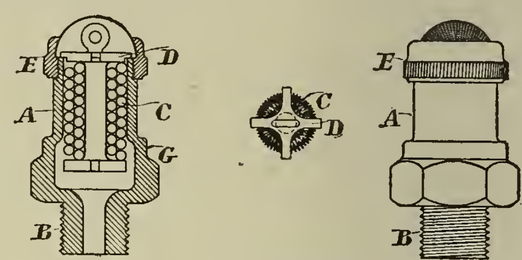
REGISTER OF PATENTS.

Gas-Testing Burner for Producer-Gas Plants.

Hiller, E. G., and the National Boiler and General Insurance Company, Limited, of Manchester.

No. 16,157; July 30, 1908.

This invention relates to a device for keeping the wire gauze on producer power-gas plant test-taps always clean and ready for use, by providing on the nozzle that carries the wire gauze a cleansing-chamber, filled with layers of coiled wire wound on a bobbin for extracting the tar, moisture, or other foreign matter from the gas before it reaches the wire gauze.



Hiller's Gas-Testing Burner.

The cylindrical cleansing-chamber A (screwed into the gas-test tap at B) is bored out parallel to accommodate the bobbin, which is wound full up with two or more layers of non-corrosive coiled wire C. The flanges of the bobbin are of cruciform shape, as shown; the top flange D being larger than the bore of the casing, so that the bobbin is held in the proper position by the flange resting on the top of the casing. The whole is enclosed by screwed cap E, into which is fixed the wire gauze. The cleansing medium is removed at times for cleaning by unscrewing the top cap and withdrawing the bobbin.

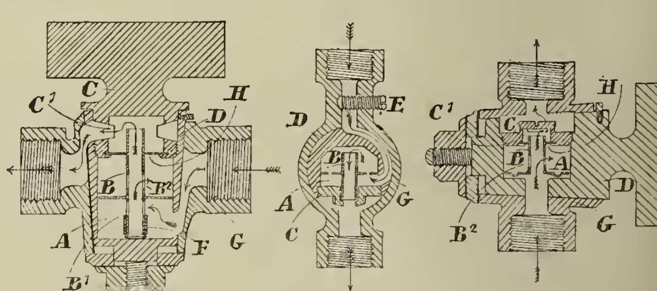
When these burners are used on suction power gas-plants where the internal pressure is below the atmospheric pressure, the burner acts as a preventative against explosion if a light is applied to the burner when the engine is at work; the construction of the burner being such that it prevents the flame being sucked into contact with the gases below the cleansing-chamber.

Combined Stop-Cock and Regulator or Governor for Gas.

Purves, T. H., of Leith, N.B.

No. 18,091; Aug. 28, 1908.

This combination of mechanism, to work in unison, provides: Firstly, for manipulating and modifying gas stop-cocks, which act in the usual way, shutting off and on when required, and having the usual conical shaped shell or barrel with conical shaped plug let in and ground into the shell or barrel, and made gas-tight and connected together in the usual way by nut and washer. And, secondly, by forming smooth cylindrical chambers of suitable sizes and in proportion to the size of the stop-cock, the plugs of which contain automatic gas-governors to regulate the required quantities of gas passing into and through the stop-cock and governor, and thence by an outlet end into the delivery pipe. A movable piston or disc, having a tube fixed centrally in it, works easily up and down in the chamber; the gas acting upon it from the under side, while the upper end of the tube acts as a valve when it reaches its highest point by striking up against the top of a small chamber or recess in a cover through which it enters centrally, as at H.



Purves's Combined Stop-Cock and Governor.

In the three modifications shown, A is the chamber wherein the disc works up and down; B, the disc; B^1, the orifice or inlet for gas into the tube of the disc; B^2, the orifice in tube above the disc, to allow part of the inlet gas to enter and form a cushion of gas on the upper side of the disc. C is the screwed cover, wherein the upper end of the disc-tube enters; and C^1, one of two slots into the side of the screwed cover for the gas to pass out through the stop-cock after coming through the disc-tube. D is the plug containing the governor; E, the shutting-off screw; F, the sliding ferrule; G, the barrel of the stop-cock; and H, a disc of thin brass with a hole in the centre for the tube of the disc to work in easily. The cover C is screwed into the top of the chamber A, excepting in the second modification (for a downward flow of gas) where the chamber is inverted, and the cover is screwed in from the under side. The tube is supported by a narrow ledge at the bottom of the central hole in the screwed cover C; the gas entering by a side passage and passing through small holes in the disc B, and thence down the centre tube of the disc to the burner—an extra pressure of gas lifting the disc where it shuts off against the horizontal top of the inverted chamber A. The covers C have short projecting ledges, to

engage with and fit the mouth of the chambers A, for the purpose of keeping both parts true and central with each other.

In the second and third modifications the top of the covers C are milled for screwing in with the fingers, or slotted for a screw-driver, and lateral openings are made for the exit of the gas at C[1].

Gas only has access to the governor when the plug is turned on, and when the lateral openings in the plug for its admission and exit are in line with, and meeting, the inlet and outlet channels of the stop-cock.

In the first arrangement, the tube is fitted with a short sliding ferrule, to regulate the supply to the required quantity by partly closing the hole in the tube. The tube of the disc is bell-mouthed at the bottom to keep on the ferrule, and is solid at the under end.

Gas-Stoves.

Borderel, J., of Paris.

No. 20,046; Sept. 23, 1908.

This invention relates to stoves to be heated internally by gas, constructed in such a manner that the combustion of the gas is "complete" and that there will be "no production of noxious gases caused by an incomplete combustion."

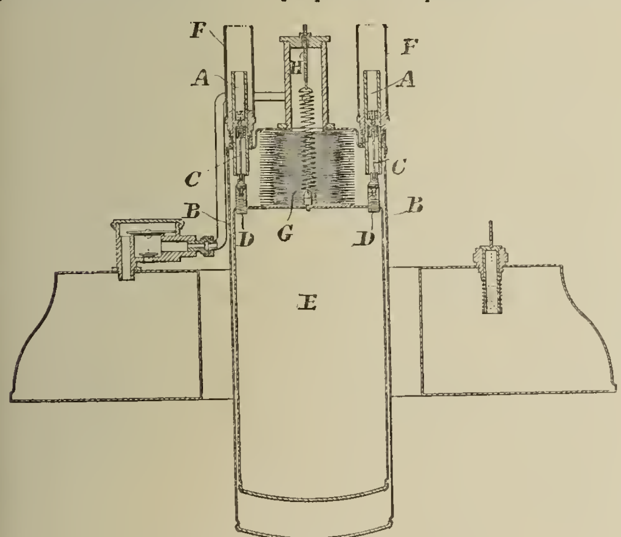
Gas-stoves are, of course, already known in which the draught is effected by the aid of cylindrical chimneys with a conical or cylindrical extension towards the base. But these chimneys have hitherto been constructed in such a manner that either the air is drawn in at a great speed, which does not give it time to mix properly with the gas, or in other cases (by reason of too abrupt alterations of section) eddy-currents are produced, which act injuriously on the complete combustion of the gas. In the gas-stove according to the present invention, the burner is completely enclosed by a chimney formed of a cylindrical part rising above the burner, and of a tapering part extending downwards, resting upon the base-plate close to the outer casing of the stove, in such a manner as to bring to the burner-flame a large quantity of air, which ascends at a very slow speed and without eddies so as to secure the complete combustion of the gas.

Compressing Gas or Air for Lamps.

Chipperfield, W. H., of Hanway Street, N.W.

No. 25,019; Nov. 20, 1908.

This invention has reference to apparatus of the type described in patent No. 20,521 of 1906—a cylindrical slide-valve attached to the outer vessel or chamber, the ports of which valve are open to the atmosphere at each end of the stroke; the downward movement of the valve being ensured by an arm mounted on a rod connected to the inner hollow body or displacer, such arm rising and falling with it, and the upward movement being effected by the rising of the inner hollow body. The present invention avoids the use of the arm extending above the slide-valve, to ensure its downward movement, and the use of the connecting rod by which the arm is operated; obviates the entrance of any dust, &c., in or around the slide-valve; reduces any noise resulting from the exhaust of the expanded air, and the intake of a fresh supply from the atmosphere; and renders the working parts of the apparatus more adjustable or removable for the purposes of inspection.



Chipperfield's Compressor for Gas-Lamps.

The illustration shows (sectional elevation) the operating mechanism of a high-pressure gas-lamp, together with the reservoir connected with it. A hollow, cylindrical slide-valve A is provided at (preferably) both sides of the top or cover of the outer vessel B. The valve is open at each end, and closed at its centre by a partition. The exhaust and intake openings are placed in the walls of the cylinder—respectively below and above the division. To the under side of the central division is connected a rod C, having at its lower end a link and screw, which takes into a correspondingly threaded recess in a stud D attached to the inner hollow body E. The screw-threaded recess is of inverted cone shape, to ensure the ready entrance of the screw attached to the lower end of the connecting rod. By these means, reciprocating motion is imparted to the slide-valve A by the rise and fall of the inner hollow body E. To the upper portion of the collar or sleeve, through which the valve works, is fitted a hollow cylindrical cover F—its upper end extending beyond the limit of the upward stroke of the valve, and has a gauze covering to deaden the sound and prevent the entrance of any foreign matter.

Instead of the weight of the inner hollow body or displacer E, and the hollow, flexible, extensible, and compressible metallic body G, being held in suspension by a spring and supporting rod, as described in the earlier patent, the top of the displacer is connected, through the medium of a spiral spring, to a screw rod H, which passes through an opening in the top of a removable cover supported by the central upper end of the outer chamber B. A screw-nut on the outer end of the rod, renders it capable of adjustment as required.

The working parts are thus more free to perform their functions, consequent upon the reduction of friction, and are less subject to wear—resulting in a more perfect closing of the body G, "by reason of the prevention of the escape of any air or gas around the reciprocating piston rod, as heretofore employed, and the compressing apparatus is rendered more sensitive and positive in its action."

Pyrophorus Substances for Ignition and Illumination.

Lesmüller, A., of München, Bavaria.

No. 27,341; Dec. 16, 1908.

This invention relates to the production of pyrophorus substances to be used for ignition and illumination.

The patentee points out that the metals of the rare earths are distinguished by considerable heat of combustion and low ignition temperature. If scratched with harder metals, small particles of the metal become detached and burn immediately—developing considerable heat and radiating intense light. The pure earth-metals possess this property to a very high degree; but as they are too soft, and oxidize too easily, they are not suitable for technical purposes. It is therefore necessary that they should be mixed with other substances in order that as small sparks as possible should be emitted. This reduces the consumption of the rarer metal to the lowest limit; the substances admixed being, of course, harder and less subject to oxidation than the metals of the rare earths. To this end, it has been proposed to alloy the rare earth-metals (by an electrolytic process) with other harder metals or a metal—such as iron for example; and it has further been proposed to add silicium to an alloy so formed. But the effect of the addition of the heavy metals to the rare earth-metals is to very considerably reduce the heat of combustion of the latter.

Now in the course of his experiments, the inventor says he has discovered that if, in place of metals, metalloids—such as silicium, titanium, or boron—are added to the rare earth-metals, a substance is produced which is very hard, economical in use, less subject to oxidation, and of much greater durability when exposed to the atmosphere than is otherwise the case. The temperature of ignition of such metal compounds is very low; so that if rubbed against a harder body, small particles are detached which inflame at once in the open air, and are adapted for igniting combustible gases, and even solid combustible substances.

If suitable oxidizing substances—for instance, potassium chloride, potassium permanganate, manganese dioxide, the super oxides of barium, magnesium, or zinc or chromates, dichromates, and persulphates—be admixed with the pyrophorous compounds, they can be used advantageously in a pulverized state for the production of flash-lights, lighting-compositions, and the like.

The combinations of the metals can be obtained by various methods: (1) The metals of the rare earths may be electrolytically separated, for example, from mixtures of chlorides or fluoride-oxides; and after the electrolysis, the silicium, titanium, or boron is mixed with the solution. The bad conductivity of the electrolytes thus produced has to be overcome by means of very high potentials, to avoid the congelation of the metal in fusion during the period of combination. (2) A simpler method would be to melt down the metals of the rare earths in a suitable crucible—for example, in a magnesia-crucible—and under a cover of molten salts (such as sodium-chloride, potassium-chloride, or chloride of barium) to exclude the air, whereupon the silicium, titanium, or boron is added. (3) The metals of the rare earths may be melted in a jet of indifferent gases, or even directly in a vacuum; the silicium, titanium, or boron being simultaneously added.

Lighting and Extinguishing Gas-Lamp Burners.

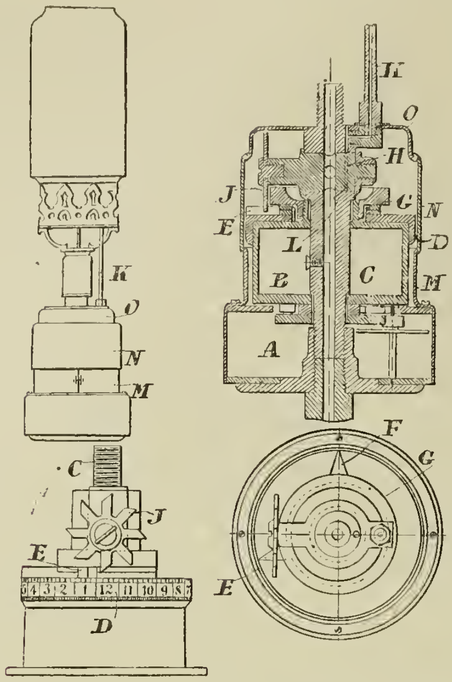
Gounevitch, E. de, of Paris.

No. 5117; March 2, 1909. Date claimed under International Convention, March 18, 1908.

This device, for bringing about the automatic lighting and extinguishing of gas-burners at given hours which can be altered, is illustrated by a whole burner provided with the device, an enlargement of the top part of the lighting and extinguishing device, a vertical section of the device, and a plan of it.

The device comprises clockwork A (only one movable wheel of which is shown on p. 584). The spring (not shown) operating the clockwork is arranged in the barrel B, the spindle C of which is constituted by the conduit used for the passage of the gas going to the burner. The circumference of the barrel is provided with a dial D divided into 24 hours—12 hours for the day and 12 hours for the night. On the upper face of the barrel are arranged two hands E F secured to, and rendered solid with, the barrel by a nut which, nevertheless, on being unscrewed, enables the hands to be moved independently of each other. One of the hands, in fact, indicates on the dial the hour for opening the burner; the other, the hour for closing. The hours can be changed by shifting the hands as explained.

The gas-conduit C and the clockwork are fixed or stationary, while the barrel B revolves about it. On the conduit is mounted a cock H provided with two holes at an angle of 90°. The plug of the cock is constituted by a star J with eight arms, four of which correspond to the openings and intersect each other, while the other four are the intermediate branches. The star is arranged in such a manner that the branch which is in the low position meets the hands E F rotating with the barrel. The dial is regulated so that the figure on it passing to the right of the bottom branch of the star indicates the exact hour. A bye-pass K, receiving its gas at L from the conduit C in front of the cock, is always alight when the burner is extinguished.



De Gounevitch's Lamp Lighter and Extinguisher.

In these conditions—assuming that the bye-pass only is burning, and that the hand E indicates by its position on the dial D the hour of opening of the burner—it will be understood that on the hand engaging with the bottom branch of the star it moves the latter to the extent of one branch, which movement will be sufficient to bring the cock from the closed position to that in which one of the openings in the plug coincides with the conduit C. The gas passing freely into the conduit, reaches the burner and becomes ignited on contact with the flame of the bye-pass, which will then be extinguished.

The hand F indicating by its position the hour of closing the burner will at that exact hour come into contact with the bottom branch of the star, which will be shifted in the same way to the extent of one-eighth of a revolution. Thus it will bring the cock into such position that none of the openings in the plug will coincide with the conduit C, and the burner will be extinguished.

A second lighting of the burner will be effected exactly 24 hours after the first, unless the position of the hand E has been modified in the meantime, by a new contact of the hand in question with the star. The same applies as regards the extinguishing by means of the hand F.

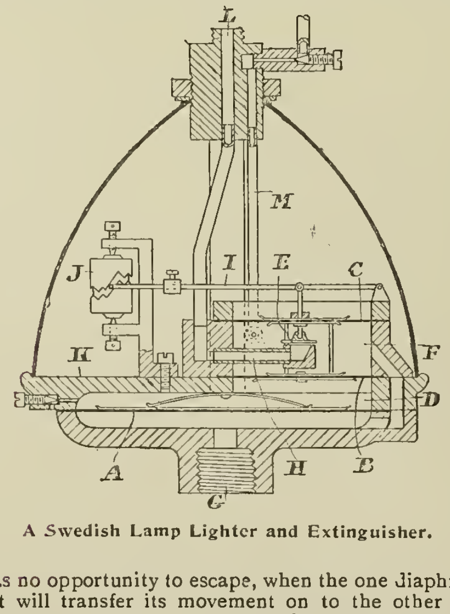
The lighting and extinguishing device can be provided with a casing made of three parts M N O which will not in any way interfere with the working of the cock, but will, on the contrary, prevent any tampering with the device; the regulation of the hands which indicate the opening and closing being possible only to the person having the means for opening the casing.

Lighting and Extinguishing Gas from a Distance.

Nassen, J. F., and Bergström, A. E. T., of Stockholm.

No. 11,371; May 13, 1909. Date claimed under International Convention, May 14, 1908.

In this apparatus two or more diaphragms are provided, one of which acts on the valve or valves for lighting or extinguishing the flames, so that the diaphragms are movable independently of each other and form walls of a closed chamber communicating with the atmosphere through a passage of such small cross-sectional area that the air within the



A Swedish Lamp Lighter and Extinguisher.

chamber has no opportunity to escape, when the one diaphragm moves rapidly, but will transfer its movement on to the other diaphragm, whereas at a slow movement of the former diaphragm the air will escape through the narrow passage, without transferring movement to the other diaphragm.

The apparatus shown is provided with three diaphragms, one of which A is larger than the two others B C, which are of about the same size and firmly connected together by rods, so that one diaphragm always partakes in the movement of the other. Situated between the first two diaphragms is a chamber D communicating through a narrow passage with the outer air. Screwed into the passage is a regulating screw by which the sectional area of the passage may be regulated. Placed in the chamber D is a blade-spring, the free ends of which bear on the upper side of the diaphragm A so that the spring counteracts the gas pressure acting on its lower side. The spring is adjusted for an average gas pressure, and is not provided with any regulating device; "it being of no importance if the diaphragm bellies slightly upward or downward."

The gas-valve E is placed in a chamber F between the diaphragms B and C, communicating through a passage at the side with the chamber below the diaphragm A, and through the latter chamber with the gas-supply conduit G. A pipe H extending into the chamber F carries a seat for the valve disc E attached by a ball-and-socket joint to the diaphragm C, which is further connected to a pivoted lever I. The lever carries a shiftable weight, and is bent at its free end toward the side so as to enter into a groove in the surface of a cylinder rotatably mounted in vertical position in an arm screwed on to the bottom plate K. The pipe H communicates with the passage L leading to the main burner, while the pilot-burner is supplied with gas through a narrower tube M issuing from the chamber F between the diaphragms B and C.

The gas enters through the conduit G into the lower chamber, from which it passes into the chamber F. However, inasmuch as the diaphragms B and C are of about the same size and connected to each other, the pressure cannot produce any movement of the diaphragms, and, on this account, the valve E remains closed. On the other hand, the gas can freely pass through the tube M to the pilot-burner. Slow fluctuations of pressure have no influence on the valve; for even if the diaphragm A rises and sinks, the compression or rarefaction thereby arising in the chamber D is smoothed out through the narrow passage at the left. If, on the other hand, the pressure in the conduit G is rapidly increased, the diaphragm A rises so rapidly that the air has no time to escape through the passage, but the pressure is propagated through the chamber D to the diaphragm B and causes it, as well as the diaphragm C, to rise and thereby open the valve E. On account of the diaphragm B being smaller than A, the former will obviously move a correspondingly greater distance.

It is, however, obvious that the valve E cannot be lifted higher than admitted by the groove in the cylinder J. When the valve rises or sinks, the cylinder turns, whereby the movement of the lever I is determined by the shape of the groove. By giving the groove a suitable form, it will thus be possible to open the valve by a desired number of increases of pressure. The closing of the valve is produced in like manner by a certain number of increases of pressure dependent on the form of the adjacent part of the groove. The apparatus is thus controlled solely by rapid increases of pressure "which are considerably easier to produce than decreases of pressure."

APPLICATIONS FOR LETTERS PATENT.

18,779.—Hughes, H. K., "Anti-vibrators." Aug. 16.

18,798.—Grainger, H. T., "Gas-stoves." Aug. 16.

18,807.—Ackland, T., "Self-closing valves." Aug. 16.

18,838.—Jones, A. O., "Treatment of gases from coke-ovens or gas-retorts." Aug. 16.

18,908.—Berlin Anhaltische-Maschinenbau Akt.-Ges., "Conveying and discharging incandescent coke and the like." Aug. 17.

18,920.—Jones, A. O., "Treatment of gases from coke-ovens or gas-retorts." Aug. 17.

19,031.—Glover, T., "Testing the capacity of diaphragms, bellows, or like measuring appliance of a gas-meter." Aug. 18.

19,112.—Alexander, W., and Applebys, Ltd., "Controlling the opening and closing of grabs, discharging of buckets, and the like." Aug. 19.

19,119.—Harvey, W. H., "Union-jet and other non-atmospheric gas-burners." Aug. 20.

19,152.—Schäffer and Budenberg, Ltd., "Pressure-gauges." A communication from Schäffer and Budenberg G. m. b. H., Germany. Aug. 20.

19,169.—Simon, C. F., "Automatic recording apparatus for measuring gaseous fluids." Aug. 20.

19,174.—Nieser, E., "Atmospheric burners." Aug. 20.

19,175.—Vaughan Williams, A. A., "Device to enable taps or cocks to be disconnected from supply-pipes or apparatus." Aug. 20.

19,184.—Gibson, T. S. F., and Palmer, W. V., "Coin-freed meters." Aug. 20.

19,190.—Woodall, H. W., and Duckham, A. M'D., "Charging gas-retorts." Aug. 20.

19,196.—Johnston, A. A., and Clark, F. W., "Gas manufacture." Aug. 20.

19,206.—Ingrey, C., and Bartlett, J., "Lighting and extinguishing gas." Aug. 20.

19,212.—Neue Kramerlicht G. m. b. H., "Valvular devices for gas-pipes of incandescent burners." Aug. 20.

19,232.—Riding, H., and Boyle, T., "Solderless joint for lead pipe." Aug. 21.

19,239.—Henderson, J., A., jun., & D., "Taps." Aug. 21.

19,258.—Gerdes, A. F., "Self-acting igniting and extinguishing apparatus for gas-lamps." Aug. 21.

19,297.—Hohmann, C., "Automatic gas-analyzing apparatus." Aug. 21.

19,300.—Streubel, A., and Wigankow, F., "Mantles." Aug. 21.

19,305.—Duckham, A. M'D., "Discharging and charging gas-retorts or coke-ovens." Aug. 21.

The Directors of the British Gaslight Company, Limited, recommend a dividend at the rate of 10 per cent. per annum, free of income-tax, for the half year ended the 30th of June.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Date of the Murdoch Gasholder.

SIR,—There appears to be an error in the date attributed to the gasholder at the Soho Works which is illustrated in the last issue of the "JOURNAL," inasmuch as gas lighting was not in use in 1798, nor until several years afterwards. It was only in that year that, according to James Watt, jun., the first experiment was made at Soho, when, we are told, Murdoch "constructed a retort of iron with a tube from it, of perhaps about 30 or 40 feet in length, and to the end of it he applied burners of various dimensions and gave light during the night time to one of the buildings of the Soho Foundry." No mention is made of a gasholder, nor was anything further done with the invention until 1801-2, when, in the latter year, "a public display" of it was made at the celebration of the Peace of Amiens. Watt further states that "till 1804 we continued making experiments . . . upon *the size and construction of the gasometers;*" and the first gas-works constructed by Murdoch, which was for Phillips and Lee's factory in Manchester, had a series of *rectangular* gasholders, each of the capacity of about 1000 cubic feet only. This is proved by the original drawings for the works, which are dated 1806, and are reproduced in my "History of the Introduction of Gas Lighting."

There is other evidence in the Murdoch papers to show that the first gasholders used by him were small rectangular vessels; and this form of holder was shown in Accum's "Treatise on Gas Lighting," published as late as 1815. Some years ago, Mr. George Tangye very kindly sent me an illustration of this gasholder at the Soho Works, which appears to me to belong to a much later period than 1798. It would, however, be interesting to know upon what grounds this year has now been fixed upon as the date of its erection.

CHARLES HUNT.

17, *Victoria Street, S.W., Aug.* 26, 1909.

Allowance of Income-Tax for Depreciation of Plant.

SIR,—An important circular has been issued by the Board of Inland Revenue to their surveyors regarding the allowance of income-tax in respect of depreciation of gas and water undertakings. The circular is of a very drastic nature, and provides as follows:—

> No depreciation should be allowed in any circumstances in respect of any portion of these undertakings. Repairs and renewals, excluding extensions and improvements, to be allowed as working expenses as and when incurred. Exceptional expenditure on *bonâ fide* renewals, where the full effect cannot be given in one year, may be carried forward in the following year or years. These instructions to take effect for the year 1908-9, and for years preceding in cases where claims of depreciation are at the present time awaiting settlement.

This circular was sent to me in connection with one of the Gas Companies under my charge, in which I had obtained an allowance of 3 per cent. on the present value of all plant and machinery. I was first granted such an allowance on appeal before the Special Commissioners on behalf of the Ascot District Gas Company, and have obtained the adoption of the same principle in some ten other Gas and Water Companies with which I have dealt.

I think it only right to point out, for the benefit of the gas industry, that the circular referred to emanates only from the Board of Inland Revenue, who are in this matter the opponents of the companies. Many people are apt to look upon the decisions of the Inland Revenue as being final and conclusive, whereas the instructions contained in the circular represent only the views entertained by the officials. It is most important that gas companies should take care that their view of the case is brought before the Commissioners of Taxes—the ultimate judges—before whom each case may be brought to appeal.

For my own part, I have given notice that I cannot accept the instructions of the Board of Inland Revenue to Surveyors as a decision, seeing that the Special Commissioners have decided otherwise; and I am therefore making the question the subject of a further appeal, on the ground that it is going back upon that which has already been settled, at considerable trouble and expense, on appeal before the Special Commissioners, when all the arguments in reference to the general question of depreciation of gas plant were brought up by myself.

I would suggest that all those who have received similar notices should take the matter up without delay, as it is of considerable importance to the whole of the gas world that the principle which has been once adopted should be retained as a basis for assessment in the future.

W. A. SCHULTZ, F.C.A.

50, *Cannon Street, E.C., Aug.* 25, 1909.

Gasification of Coal in Vertical Retorts.

SIR,—In your issue of the 24th inst., there is a welcome communication in Dr. Lessing's letter where he challenges and criticizes the recent experiments of Dr. Julius Bueb, on "The Procedure of Gasification in Vertical Retorts."

The usefulness of such experiments as those of Dr. Bueb is entirely lost in the great and varying conditions between purified coal gas and gas freshly-evolved from the coal undergoing carbonization. Passing notice might be taken of some results of mine that were published in the "JOURNAL," Jan. 12, 1904, p. 80, showing the loss of illuminating power of coal gas by passing it through a tube of red-hot coke, as was similarly done recently by Dr. Bueb.

The question of thermal decomposition being dependent on the rate, or impediment, of flow, as spoken of by Dr. Lessing, calls for something more deserving than can here be dealt with. I would, however, beg for space to add that, in a series of tests I made on coal gas with added enrichment, and passing through a tube of hot coke, I found that the added illuminating power was the first to be lost, and that too very rapidly.

These tests led me to the conclusion that there was an enormous difference in passing purified coal gas through hot coke and what was actually taking place inside a retort, and that the full answer to the question of the destructive influences regulating the decomposition of the gas, whether through coke, rate of flow, or impediment—remained between the point of distillation and the point where the gas reached its fixed state; and that in this margin I saw the worthlessness of all the tests I had made in the laboratory.

I quite agree with Dr. Lessing that the best object-lesson to solve the travel of gases is positive observation and a close study of the coke produced. Dr. Bueb has already said (March 13, 1906): "The gas evolved on carbonization will seek the way of least resistance; and so, passing into the middle of the retort, this core serves as an exit passage."

At Exeter, with whole (dumped-in) charges in the vertical retort, we found there was a hole through the centre of the mass of coke left in the retort, which also pressed tightly on the side of the retort.

From careful observations, I have never found—nor do I still believe—that the passage of gas in vertical retorts is at any time between the retort and the outer crust of coke. The transmission of heat from all points of the circumference towards the centre of a practically cool mass of coal maintains a gentle outward expansion, keeping the first coke made tight against the retort.

The core—cool at first—becomes a swelling, plastic, bubbling mass of coal and tar together, through which the gas evolved from the bottom (poor in quality, it may be, to start off with) of the charge and upwards, must pass through the centre, while some of the tars from the highest portion of the charge necessarily drain downwards.

The penetration of heat becomes more and more rapid, by reason of less area and capacity, until there is nothing left to expand or even fill the void of all that was volatile.

From the hole in the coke with its spider-web-like bridges of tar-coke and the sides spotted with beads of tar-coke, it would appear that the last stage of carbonization is one of sudden contraction.

At Exeter, many engineers saw pieces of coke nearly 3 feet in length, and 1 ft. 6 in. diameter, and a hole through the length of it—as near a circle as possible—about 5 inches in diameter. Many such pieces were produced; and, close study, with careful observation of the charge in the retort, left no doubt as to the travel of gas in vertical retorts being central.

The temperatures of the charges given by Dr. Bueb ("JOURNAL," March 13, 1906) add proof of a centre passage. Dr. Bueb then gave the temperature of the core of the charge as only being raised 250° C. in five hours after the retort had been charged.

T. SETTLE.

Exeter, Aug. 28, 1909.

LEGAL INTELLIGENCE.

GAS COMPANIES' LIABILITIES.

The following is one of the notes in the "Legal Column" in the current number of the "Builder."

A recent decision in the Privy Council raised some interesting points in connection with the liability of gas companies. The defendants were the Dominion Natural Gas Company and the Toronto, Hamilton, and Buffalo Railway Company; the plaintiffs being certain workmen in the employ of the latter Company or their representatives who had suffered injury from a gas explosion. The Gas Company, in consideration of obtaining a wayleave for one of their mains, had contracted to supply the Railway Company with gas at reduced rates, and to furnish meters and regulators. The gas was natural gas, obtained at very high pressure, and it was necessary to reduce this before the gas was used. Part of the apparatus employed to effect this object was a safety-valve. The plaintiffs were suing both Companies. The Railway Company contended that there was no negligence on their part, and that they had discharged their duty by employing competent persons—the Gas Company—to provide the system. The Gas Company alleged, however, that the servants of the Railway Company interfered with the apparatus; and it was proved that they had inserted a tap before the pipe entered the regulator, and had also hammered the safety-valve.

The Courts in Canada had found against the Gas Company; and that Company appealed to the Privy Council. There being no contractual obligation between the plaintiffs and the Gas Company, the Court had to consider what duty the Company owed to the plaintiffs; and it held, on decided cases, that in the supply of articles dangerous in themselves a peculiar duty was imposed on those supplying them, and that in the absence of due precaution it was no defence to say the accident would not have happened but for some other agency, unless the proximate cause was the conscious act of the other agency. In the case in question, the Jury had found that there was negligence because the safety-valve was installed with an emission into the shop instead of into the open air. The true cause of the escape of gas was left in doubt; but it occurred at the safety-valve, not at the tap inserted by the servants of the Railway Company; and the Court held that, initial negligence having been found against the Gas Company, they had failed to prove that the proximate cause of the accident was due to the intervention of the Railway Company's servants and that the Gas Company were liable.

Gas Suffocation Case at Norwich.—Walter Stannard, aged 39, a Norwich upholsterer, was found dead in his house on the morning of last Sunday week, with the gas-burner in the room turned on, but not lighted; and at the subsequent inquest, the jury found that death was due to asphyxia from an escape of gas, but that there was nothing to show how such escape occurred. From the evidence given it appeared that deceased was seen to be the worse for drink on the Saturday morning. The gas-burner was in good order; and on a table beneath it was found a spent match, of a similar kind to others found in the pocket of deceased. No one was in the house with Stannard on the night of the occurrence.

MISCELLANEOUS NEWS.

PROVINCIAL GAS COMPANIES.

Reduction in Price at Bath.

The report presented by the Directors of the Bath Gas Company at the half-yearly meeting last Wednesday was in all respects of a satisfactory character. It set forth that there had been a substantial increase in the consumption of gas, and a decrease in the cost of coal, in the six months ended the 30th of June; and that the favourable condition of the revenue account enabled the Directors to announce a further reduction of 1d. per 1000 cubic feet in the price of gas—bringing it down to 1s. 11d.—from the past Midsummer quarter. The revenue from the sale of gas in the half year was £31,956, against £31,150; but residuals produced only £10,022, compared with £11,919. The total receipts were £46,421, against £47,206. The expenditure, however, was £36,033, compared with £36,286. The balance carried to the net revenue account was £10,388; and the amount available for distribution was £15,320. The Directors recommended the maximum dividend of 5 per cent. per annum on the consolidated stock.

Half-Year's Work at Brighton.

In the report presented by the Directors of the Brighton and Hove Gas Company at the half-yearly general meeting last Friday, they stated that, compared with the results for the corresponding period of last year, the sale of gas in the six months ended the 30th of June had increased by 9,294,200 cubic feet, or 1·52 per cent., but that the sale of residuals had realized £2744 less. The quantity of gas sold to ordinary consumers was 583,491,300 cubic feet; under contracts, 19,202,500 cubic feet; and for public lighting, 17,943,800 cubic feet—making a total of 620,637,600 cubic feet. This produced £91,425; rental of meters, £8992; sale of residuals, £16,877—miscellaneous receipts bringing up the total to £117,451. The expenditure on the manufacture of gas came to £59,345 (raw material costing £41,813); on distribution, £20,593; and on management, £4900—the total expenses being £90,731; leaving £26,720 to be carried to the profit and loss account. Adding the amount received for interest and £12,950 brought forward, a total of £39,689 was produced. After charging interest on the debenture stock, &c., a sum of £37,017 was available for distribution; and the Directors recommended the payment of dividends at the rates of 6 and 4 per cent. per annum on the "B" and "C" preference consolidated stocks, and 11 and 8 per cent. per annum on the original and "A" ordinary consolidated stocks. These payments would amount to £23,653, and leave a balance of £13,364 to be carried forward.

Good Carbonizing Results at Chichester.

A very satisfactory state of things was again reported at the ordinary half-yearly meeting of the Chichester Gas Company on Monday last week. The accounts for the six months ended the 30th of June showed a balance to the credit of the profit and loss account (after providing for the interest on the debenture stock, loans, &c.) of £2249, out of which the Directors recommended the declaration of a dividend for the half year at the rate of 10 per cent. per annum on the "A" stock, and 7 per cent. per annum on the "B" and "C" stocks, all less income-tax. They reported that the business of the Company continued to improve, but expressed regret that the price of coal remained high. The Engineer (Mr. T. E. Pye) reported that the works and mains were in good order. In moving the adoption of the report, the Chairman (Mr. Alfred Lass) said the carbonizing results of the half year had been exceptionally good. The 2753 tons of coal used produced 34,151,000 cubic feet of gas, or a yield of 12,405 cubic feet per ton, together with 12½ cwt. of coke, 10½ gallons of tar, and such a quantity of ammoniacal liquor as would produce on an average sulphate of ammonia equal to 21¾ cwt. per 100 tons of coal carbonized. The quantity of gas sold had been 30,376,000 cubic feet, or 11,034 cubic feet per ton of coal. The increase in the sale of gas on the corresponding period of last year was 1,180,300 cubic feet, or 4·04 per cent.; while the illuminating power and the purity of the gas had been fully maintained. Turning to the revenue account, the shareholders would find that the total receipts from the sale of gas and residual products amounted to £7294, and the total expenses to £5505, which left a gross profit of £1789. The net profit available for dividend was £1486, which, at the various rates recommended, amounted to £1482. Mr. W. A. Walker seconded the motion. Mr. J. Cash (the Engineer of the Brighton and Hove Gas Company), in supporting it, said the Company's position was all the more gratifying in view of the threatened competition from the Electric Light Company. However, they were not at all disheartened by the introduction of electric light into the city, as they could fight it easily. His own experience in Brighton had shown him that they could well hold their own against the electric light; and only a few days previously they had been successful in obtaining a contract for seven years to light the Brighton Railway Station, and a large number of workshops, in face of an extremely low tender on the part of the electricians. It was a strenuous fight, but the Gas Company won it on their merits. He concluded by complimenting the Engineer on his excellent working for the half year. The dividends recommended were then declared; and votes of thanks were accorded to the Engineer, the Secretary (Mr. Victor V. Vick), and the other officers of the Company, as well as to the Directors.

Satisfactory Half Year at Cork.

The ordinary half-yearly general meeting of the Cork Gas Consumers' Company was held last Thursday—Mr. George Lynch in the chair. The Directors reported a decrease in the rental consequent upon a reduction in price at the commencement of the half year, but stated that there had been a slight increase in the consumption of gas. The accounts showed a balance of £5159; and the Directors proposed to pay a dividend at the rate of 8 per cent. per annum. As this would require £5531, it would be necessary to take £372 from the reserve fund. In moving the adoption of the report, the Chairman said the Directors were pleased to be able to record a satisfactory half-year's work. Though they had to take something from the reserve fund to make up the usual dividend, when the causes of the deficiency were considered there was little reason for dissatisfaction. It was chiefly owing to the reduction of 3d. per 1000 cubic feet in the price of gas made at the beginning of the half year. When coals became so much dearer that the Directors had to advance the price, they promised to reduce it again when coals were cheaper. They were so anxious to keep their word to the letter that they were rather premature in making the reduction, having still a considerable quantity of dear coal to work off. Nor did they count on so reduced a return from residuals. Besides being lower in price, there was, from various causes, a deficiency in the quantity sold. At the end of the half year, they had 709 tons of coke on hand, while at the corresponding time last year they had only 57 tons. There had, however, been no falling off in the quantity of gas sold—on the contrary, an augmentation. There was also a steady continuous increase in the various appliances for the use of gas for other purposes than lighting, such as cooking, heating, &c. The number of slot-meters in use was much over 4000; indicating that the working classes were largely availing themselves of the advantages of using gas. Having given particulars in regard to the Company's contracts for the public lighting of different divisions of the city, the Chairman concluded by referring to the visit of the deputation of the Streets Committee of the Corporation of London to various Continental cities, and to the recent success of the Brighton and Hove Gas Company in securing the lighting of the Brighton Railway Station and workshops, as showing that the tide is already turning in favour of gas for street lighting. Mr. Harrington seconded the motion; and it was carried without discussion. The dividend proposed was then declared, and the other business of the meeting disposed of.

Gas Displaces Electricity at Melton Mowbray.

The annual meeting of the Melton Mowbray Gas Company was held last Friday—Mr. J. Glover, J.P., in the chair. In moving the adoption of the accounts, the Chairman said he considered they were very satisfactory; but, owing to extraordinary expenses charged to revenue account, the amount available for dividend was slightly less than last year. The balance, however (£1688), allowed of the payment of the usual dividend of 7½ per cent. on the ordinary share capital. The works had been well maintained, and were in first-class condition; the Directors having during the year added to their purification plant a Livesey washer and a washer-scrubber. One of Braddock's retort-house governors had also been put in; this work being entrusted to Messrs. Robert Dempster and Sons, of Elland. During the past eight years, the streets of Melton had been lighted by electricity; but for the next five years the Gas Company had secured the lighting contract, and the general opinion of the public was that the streets had never been lighted so well as now. The greater part of the work, which included the fixing of eight 1000-candle, six 700-candle, and eight 200-candle Lucas lamps, was entrusted to Messrs. Pontifex and Co., and under the supervision of the Manager of the works (Mr. G. R. Casterton), was expeditiously carried out. The Chairman proposed a vote of thanks to him, and expressed great satisfaction at the general working of the year. The coals carbonized were 3890 tons with a make of 40,726,000 cubic feet of gas—an advance on last year of 2,900,000 cubic feet. Coal contracts had been made at a slight reduction on last year's prices; and with a larger output of gas no doubt was entertained that an even more successful year than the last was before them.

Success of Free Fittings at Royston.

The fifth ordinary general meeting of the Royston (Yorks.) and District Gas Company, Limited, was held at Leeds last Tuesday. Mr. Henry Ellison, the Chairman, presided, and submitted the Directors' report, which stated that, after paying interest on debentures amounting to £225, and the interim dividend on the ordinary shares of £1200, there remained a balance of profit for the year of £2740, which, with £452 brought from last year, made £3192. It was therefore recommended that a dividend at the rate of 12 per cent. per annum for the half year ended June 30 should be paid, which would absorb £1800, and make with the interim dividend for the six months to Dec. 31, 1908, a dividend for the year at the rate of 10 per cent. (free of income-tax). It was also recommended that £750 should be written off for depreciation and preliminary expenses, leaving £642 to carry forward. The Chairman remarked that £4462 had been expended on capital account in an extension of the mains, services, meters, and fittings to Barugh and Smithies. During the year 609 additional meters had been placed, making a total of 4020 now fixed, of which 3548 were prepayment and 472 ordinary. The amount of gas sold was 40,853,300 cubic feet. Having regard to the scattered district supplied, he considered this result justified the policy adopted five years ago of supplying free fittings. The recommendation of the Directors was unanimously adopted. A feature of the meeting was the addition to the Board of Mr. Robert Porter, of Elland. Mr. Porter has acted throughout as Engineer to the Company; and his election as a Director will be regarded as a fitting reward for the successful efforts which he has made on behalf of the undertaking.

A Growing Business at Sutton.

In the report which was submitted at the recent half-yearly meeting, the Directors of the Sutton Gas Company stated that during the past six months the consumption of gas had increased by 7,382,000 cubic feet, or 7½ per cent.; and the revenue from the sales of gas, residuals, and rentals of meters and stoves, showed an increase of £1000 over the corresponding period of last year. In consequence of the increased demand in the southern district, they had been obliged to lay an additional trunk main, which was now nearing completion. The profit and loss account showed a balance of £12,910, from which they recommended the payment, under the sliding-scale, of a dividend at the rate of 5¾ per cent. per annum (less income-tax) for the half year. In moving the adoption of the report and accounts, the Chairman (Mr. Frederick Budgen, J.P.) desired to congratulate the shareholders upon a most successful half year. As a result of their working, they were in a position to recommend the full dividend, according to the sliding-scale, that the present price of gas entitled them to provide—5¾ per cent. per annum. The sales of gas had increased by £1104,

meter-rents by £78, and rental of stoves by £97. Coke was the only item that had produced less revenue. As with other companies, coke had been a drug with them; and £320 less had been received for it. Tar had, however, increased; and £166 more had been received for sulphate. The number of ordinary consumers had increased by 135, slot-meter users by 211, cookers by 124, and gas-fires by 97. So they would readily perceive that their business was a growing one; and it was also, he was glad to say, a remunerative one. It would, perhaps, be interesting to compare the position of the Company and the consumption of gas with twenty years ago. Then 63,700,000 cubic feet of gas was consumed. Ten years afterwards, the amount had risen to 99 millions; and for the year that was now ended, the total was 202 millions. The increase in the consumption of gas was noticeable at the introduction of the slot-meter. The report was adopted; and the dividend recommended was declared.

Progress of the Prepayment System at Waltham Abbey.

At the half-yearly general meeting of the Waltham Abbey and Cheshunt Gas Company last Tuesday, the Chairman (Mr. Alfred Kitt) submitted a report which set forth that the sale of gas had increased by a satisfactory percentage, derived mostly from the progress of the prepayment meter system, and that the whole of the Company's plant (under the supervision of Mr. W. Bince Randall, the Engineer and Secretary) had been maintained in a good and efficient condition. The accounts accompanying the report showed that the revenue from the sale of 36,764,900 cubic feet of gas was £6908, and from residual products £1795—the total receipts being £8706, compared with £8554 for the first half of 1908. The expenditure on the manufacture of gas was £4045; on distribution, £674; and on management, £444—the total expenses being £5931, against £6070. The balance carried to the profit and loss account was £2805, compared with £2484; and the amount available for distribution was £3333. Out of this sum the Directors recommend the payment of dividends at the rate of 8½ per cent. per annum on the "A" shares and 6½ per cent. per annum on the "B," "C," and "D" shares; also the placing of £290 to the credit of the renewal fund. This, with the interest on the debenture stock, would require £2733, and leave £600 to be carried forward. The report was adopted.

Co-Partnership at Watford.

At the half-yearly general meeting of the Watford Gas Company last Thursday, the Directors reported a profit of £3789; and the accounts presented showed a balance of £6513 available for distribution. Dividends at the rates of £7 2s. 6d. per cent. per annum on the "A" stock, and of £5 12s. 6d. per cent. per annum on the "B" stock, were recommended. In moving the adoption of the report, the Chairman (Mr. E. J. Slinn) mentioned that since the meeting held this time last year the Company had sold £3000 of additional stock at the best premium they had ever realized—viz., £533. The number of shareholders had increased by 100 during the past five years; showing that the holding of stock in gas companies was decidedly popular. The expenditure on capital account was chiefly for the new retort-house and coal-store, which were almost finished. Having referred to the principal items in the revenue account, the Chairman stated that the sale of gas was very satisfactory. The reduction they decided to make, as from the 1st of July, would be a concession to the consumers during six months of something like £900. This had not been brought about without due regard to the future. The Directors had made a good contract for coal for the next twelve months, and also for oil for two years. A new departure made by the Directors during the past half year was co-partnership. The Board drafted a scheme, the principal variation from the usual order of things being that the employees contributed to it. This began in July, and the employees were beginning to see the advantage of it in economical working and looking after their own interests. The scheme meant loyal service to the Company. To sum up, it meant time and material saved, mistakes and complaints avoided, and last, but not least, the stockholders would come in for some share of the benefits and get more dividends. The Chairman concluded by giving the proprietors some interesting information in regard to the history of the gas industry. The report was unanimously adopted. The Chairman proposed a vote of thanks to the staff; saying that if the Directors' efforts were not seconded by a good staff, their work could not be so successfully done. The motion having been carried, the Secretary and Manager (Mr. Duncan Royal) returned thanks, and said the staff were very proud to belong to the Company, and to have their efforts recognized in the way they had been.

Striking Increase in Consumption at Weymouth.

The Directors of the Weymouth Consumers' Gas Company reported, at the half-yearly general meeting last Thursday, that the accounts for the six months ended the 30th of June revealed a further extension in the Company's output of gas; the quantity sold during this period being 56,927,700 cubic feet, which was an increase of 3,709,200 cubic feet, or 6·9 per cent., upon the quantity sent out in the first half of 1908. There was, consequently, an increase in the receipts from gas; and the meter and stove rentals showed an advance. These amounts were, however, largely discounted by the diminished returns from residuals owing to the fall in prices. The balance of profit, after paying the fixed charge upon the debenture stock, enabled the Directors to recommend the declaration of a dividend for the half year on the ordinary stock at the maximum rate of 5 per cent. per annum, less income-tax. In moving the adoption of the report, the Chairman (Mr. J. E. Robens) said he thought the shareholders could not do better than congratulate themselves on the success of the past half-year's work. When they considered the great slackness of trade and the depression generally, he thought they must all be very satisfied to think that they had come out with an increase in their gas consumption of 3,709,200 cubic feet, so that their income was now £8539. This was indeed satisfactory, especially considering that they had now to compete with the electric light. When this light was introduced, 68 millions was the extent of their output; and their then Manager (Mr. Lowe) thought it would be a long time before they advanced beyond this figure, because the taking away of the light by the Corporation (and the main portion of the lighting of the borough) and the loss they would necessarily sustain through many of their customers adopting the electric light would be a great check on their undertaking. It was under these circumstances that their present Manager (Mr. D. F. Colson) came to them. They had met with a check for the first year, and during the first half of the year they lost 1½ millions; but in the second half they recovered this, and at the expiration of the year found themselves with 750,000 cubic feet in advance of the preceding year. So that, though they were checked to a considerable extent, they were not thrown backwards beyond the position they had formerly occupied. In that year—five years ago—they had only 250,000 cubic feet increase; but since then the 98 millions had risen to an output of 120 millions; and he thought the shareholders would readily congratulate their Manager on the success which had attended his administration of the affairs of the Company since he had been among them. But the effect of their having increased from 98 to 120 millions had necessitated considerable outlay; and one thing they found necessary was a new holder. This had been put up and already paid for, and was working most satisfactorily. They had also added other things which were necessary; and they were now erecting new purifiers. Referring to the satisfactory relations existing between the consumers, the Corporation, and the Company, he said the consumers looked to them with considerable interest, and placed considerable confidence in them; and the Corporation regarded them as being united with them in receiving the benefits of the Company. The consumers enjoyed with them the advantages of the reduction in the price of gas, and this reduction would necessarily follow after they had put the machinery in proper order. The motion was carried unanimously, and the dividend recommended declared. Votes of thanks were accorded to the Chairman, Directors, Manager, Secretary (Mr. E. Y. Wood), and staff, and duly acknowledged; and the proceedings closed.

Progress at Worthing.

Addressing the shareholders at the half-yearly meeting of the Worthing Gas Company last Saturday week, the Chairman (Mr. H. H. Gardner) said the amount added to capital expenditure during the past six months was £1977, making a total to the end of June of £130,306, to which must be added the nominal capital on consolidation—viz., £38,662, making a total of £168,968. The first item in the capital account expenditure was £1299 for new buildings, plant, &c.; and other expenditure included £635 for additional mains and services and enlargement of old mains. The Directors had instituted a policy of dealing with the old mains that had been laid for some thirty years, by replacing them with new ones out of revenue; but where a larger size main was required, the difference would be charged to capital. New additional meters had been put in at a cost of £234, represented by 66 slots and 50 ordinaries, making a total of 116, which represented the number of consumers added during the half year. The total number of slot meters was now 2943, and of ordinary meters 2859, making a total of 5802 consumers. The coal bill was less by £251; £149 of this being the result of a reduction in the price, and £102 of a reduction in quantity. Notwithstanding the reduction in the price of gas of 2d. per 1000 cubic feet from April 1, which cost the Company £263, the revenue from the sale of gas had gone up by £323; and it must be further remembered in this connection that many great economizers had been brought into use by consumers, which reduced the quantity of gas required. The increase was very satisfactory; and the figures showed excellent working results, reflecting great credit on their Engineer (Mr. W. A. Walker). Repairs and renewals of mains had gone up by £231, which, he thought, established beyond question the prudence of providing £500 towards this outlay in the last half-yearly accounts. There was an increase in the total receipts (compared with the corresponding half of last year) of £373, and a decrease in the expenditure of £195; the net result being an additional profit balance of £568. The balance available for dividend purposes now stood at £16,355, and was £206 higher than the amount brought forward from the previous half year; while they were better off than a year ago by £1478. The motion for the adoption of the report having been seconded, Mr. Schweder said it was claimed that there was a balance available on the profit and loss account of £16,355. Would they tell him where it was, and how they arrived at it? As far as he could see, according to the figures, they owed £24,143, against which they had due to them £12,425. Mr. Alfred Lass then gave an exhaustive statement of an investigation into the affairs of the Company. In the period from 1898 to 1908, the capital employed had, he stated, increased by £50,607, or 5 per cent. per annum compound; and in the same time the gas made had increased by 79,833,000 cubic feet, or at the rate of 5½ per cent. per annum. As the business of the Company had increased at a greater rate per cent. per annum than the additional capital, it was clearly proved that the capital to meet increased business was not called up before it was required. In 1898, the gas sold per ton of coal carbonized was 9898 cubic feet; in 1908, it was 10,489 feet—an increase of 691 feet. These results were remarkably good, and reflected great credit on the Engineer. In 1898, the number of consumers was 2404; and in 1908, 5690—an increase of 3286. In the same period, cooking and heating stoves had increased from 552 to 3973. In 1898, the profits on the year's working totalled £5882; and in 1908, £8092—an increase of £2210. In addition to the dividends regularly paid to the shareholders, the following amounts had been taken out of the profits: Reserve fund, £2808; insurance fund, £2023; renewal fund, £1506—a total of £6337. After paying the dividends for the half year, there would remain, in addition, accumulated profits of £13,432—equal to the payment of more than two years' dividends, assuming the Company did not earn a penny-piece during that period. The Company's assets were quite sufficient to meet the liabilities. If the assets were realized to-day, the Company would be in possession of £24,143, and after paying off the trade liabilities would have in hand £22,692 for division among the shareholders. They might, therefore, assume that the value of the Company's undertaking was somewhat in excess of the capital invested in it. The Company was exceedingly prosperous; and the shareholders ought to congratulate themselves that their investments were so well secured, and that the business was so judiciously and so economically conducted. The report was adopted; and a dividend at the rate of 5 per cent. per annum was declared. Subsequently an extraordinary general meeting was held, at

which the Directors were authorized to raise a sum of £38,980 debenture stock. It was explained that the Board had postponed as long as possible a further issue of capital; and, as a result, the necessary expenditure had occasioned a considerable overdraft on capital account, which must now be provided for.

WINDING-UP OF THE BELPER GAS COMPANY.

Acquisition of the Undertaking by the Derby Gas Company.

A General Meeting of the shareholders of the Belper Gas Company was held at the offices of the Derby Gas Company last Friday for the purpose of having an account laid before them showing the manner in which the winding-up of the Company, on the acquisition of the undertaking by the Derby Gas Company, had been conducted and the property disposed of, for discharging the Liquidators (Mr. Joseph Pym and Mr. J. Ferguson Bell) from their office, and handing over the books and accounts to the Derby Gas Company. The chair was occupied by Mr. Joseph Pym.

Mr. H. Bullivant (the Secretary of the Derby Gas Company) having read the notice convening the meeting,

Mr. Bell, in response to a request by the Chairman, made the following statement with reference to the winding-up: An agreement was entered into by the Belper Gas and Coke Company on Oct. 30, 1907, to sell their undertaking as a going concern to the Derby Gas Company as from Oct. 21, 1907. Special resolutions were passed for the voluntary winding-up of the Belper Company, and in order to carry out the agreement to sell and wind-up the affairs of the Company Mr. Pym and himself were appointed Liquidators. On Dec. 11, 1907, they entered into an agreement to transfer the undertaking of the Belper Company, to date from Oct. 21, 1907, and the Derby Company agreed to purchase, subject to their obtaining the necessary parliamentary powers to enable them to do so. The Directors of the Derby Company promoted, as agreed, a Bill in Parliament last year, which received the Royal Assent in June, authorizing, among other things, the purchase of the Belper Gas Company upon the following terms: For each share held by a member of the Belper Company, a sum of £20 consolidated ordinary stock in the Derby Company. The capital of the Belper Company consisted of 600 £10 shares fully paid, or £6000, and £2000 5 per cent. debentures. The purchase price agreed upon, as stated in clause 3 of the Derby Gas Act, 1908, in the agreement dated Dec. 11, 1907, between the Liquidators and the Directors of the Derby Company, was £14,600 of consolidated 5 per cent. stock; and the Directors issued to the Liquidators £14,600 of their ordinary consolidated stock. The Liquidators transferred £12,000 of this stock for the 600 £10 shares to the shareholders in the Belper Company, in accordance with their holdings. The balance (£2600 of stock) was sold at an average of £123 per £100, and brought in £3200. From this sum £2000 of debentures were paid off; and of the balance of £1200, £700 was handed to Mr. Pym for the Directors of the Belper Company for compensation for loss of office, and £500 to Mr. Pym for compensation to him for loss of office, as specified in the agreement of Oct. 30, 1907, made between the two Companies. In addition, in consideration of there being a credit balance at the bank, and a surplus after the Derby Company had discharged all liabilities and received outstanding accounts, which were estimated at about £600, the Directors of the Derby Company agreed to pay, in addition to the bonus already named, a bonus of £1 per share. This was paid by the Liquidators out of the assets of the Belper Company, and also later an extra bonus of 8s. per share obtained by the sale of public lamps to the Belper Urban District Council—these lamps not being included in the sale of the Belper undertaking to the Derby Company. The Liquidators arranged with Mr. Bullivant for him to keep the accounts from the commencement until Dec. 31 last, when they were transferred to the Derby Company. Messrs. Timms and Walker had audited the accounts. In addition, the Liquidators paid dividends at the rate of 10 per cent. per annum to the shareholders of the Belper Company. Mr. Bell added that he had before him a detailed statement of the various payments amounting to £16,702 13s. 3d.; and if anyone desired to ask any question concerning them he should be pleased to answer.

No questions being asked,

Mr. Frank Smith proposed—"That the accounts submitted to this meeting, showing the manner in which the winding-up of this Company has been conducted and its property disposed of, be and are hereby approved: That the Liquidators be and are hereby discharged from their office; and that the books and accounts of the Company be handed over to the Derby Gaslight and Coke Company." He remarked that it seemed to him that everything had been carried out in a very business-like manner, both to the advantage of the Derby Company and undoubtedly to the advantage of the shareholders of the Belper Company.

Mr. Woolley seconded the motion.

A shareholder wished to move an amendment; but it was ruled out of order, and the motion was carried with one dissentient.

Dawlish Water Supply.—Last week the members of the Dawlish District Council and the officials made their annual inspection of the water-works. Exceptional interest attached to the visit, because the Council have in view a scheme for improving the storage, which will ensure a constant supply of water. At the subsequent luncheon, Mr. J. Shaptor, the Chairman of the Water Committee, said the negotiations with reference to the new scheme was being pushed forward as rapidly as possible. When the scheme was carried out, they would have one of the best and purest supplies of water it was possible to have. Mr. F. S. Cole, the Clerk to the Council, pointed out that the town was in an exceptionally good financial position, as the last instalment of a loan of £10,000 on account of the water-works would fall due in February next. Mr. Churchward, the Surveyor, remarked that in the valley in which their reservoirs were situated they could easily make provision for the storage of sufficient water to supply a town three or four times the size of Dawlish.

EASTBOURNE GAS COMPANY.

Cheap Gas for Hailsham and Polegate—Company's New Act.

The Ordinary General Meeting of the Eastbourne Gas Company was held at the Offices on Monday last week—Dr. G. A. Jeffery, the Chairman, presiding.

The Secretary (Mr. J. S. Garrard) having read the notice convening the meeting, the report of the Directors, together with the accounts for the six months ended the 30th of June, was presented. The latter showed a profit of £7456 on the revenue account; and a sum of £16,862 available for distribution. The Directors recommended that a dividend for the half year should be declared at the rate of 15½ per cent. per annum on the £20,000 of original capital, and also on the £12,500 raised on "C" shares; and at the rate of 12⅜ per cent. per annum on £94,000 raised on "B" shares. These will absorb £8393; and leave a balance of £8469 to be carried forward.

The Chairman, in moving the adoption of the report, remarked that the reduction in price from 2s. 8d. to 2s. 6d. per 1000 cubic feet in January last entailed a loss of nearly £1800 to the Company; and they were giving this sum to the consumers and the public authority—giving them the cheapest gas they had ever had. But they were also paying the shareholders 15½ and 12½ per cent.—the largest dividends they had ever received. Therefore, both parties ought to be, if they were not, thankful. Really, the cup of the shareholders was full to overflowing. With regard to the accounts, he was afraid he could not make so satisfactory a statement. The depression in the country had something—in fact, a great deal—to do with it. The sale of gas had increased from 209·4 to 213·11 million cubic feet—or a rise of 3¾ million cubic feet. This was really a falling off from previous returns, owing to the unfavourable season. The number of consumers was 4534 ordinary and 4466 on the prepayment system; making a total of 9000—a gain of 262. This was favourable for a half year. The leakage was still high, and he thought was not satisfactorily accounted for. The net profit was £7456—a decrease of £633. Coals had cost a little less; and they had gained something like £500 through it. Residuals had sold for a little less. Coke especially had had a bad sale; and they were reducing the price of it again. Rates and taxes had been a little lower; and they had gained about £52. Tar and ammonia had sold for a little less. Coke, tar, and ammonia were among the chief products from which they derived their income. They yielded less this year than before, and the reason had been the depression in the country. The weather also had been against the Company. He hoped the shareholders would see, therefore, that the results mentioned in the report had been unavoidable; and next half year he should be able to give them a better analysis. Passing on to refer to the Company's Act, the Chairman said the Directors asked the shareholders' authority to promote a Bill for the acquisition of the undertaking of the Hailsham Gas Company. The Directors met the Directors and the shareholders of that Company on two or three occasions, and soon came to an agreement to purchase. There had been no friction between them; and he believed they would in future promote the Company's interests in every way they possibly could. They were opposed by the East Sussex County Council, by the London, Brighton, and South Coast Railway Company, by the Corporation of Eastbourne, and by the Eastbourne Rural District Council. The opposition of the first three authorities was really a courteous and friendly opposition. But with the Eastbourne Rural District Council there was some difficulty. Their requirements were so exacting and unreasonable, and moreover so unintelligible, that the Directors could not entertain them. They went to Parliament; and the Bill passed safely through both Houses and had received the Royal Assent. All, therefore, was now plain sailing. The Company had a large area, including Eastbourne, Hailsham, Polegate, Hampden Park, Willingdon, Arlington, Hellingly, and parts of Hurstmonceux and Waldron. But they were denied the right of serving part of the area of the Rural District Council, though they had had a petition from the chief residents and a great number of the inhabitants asking for a supply of gas. Well, they were deprived of it, for what reason he did not know. He thought there was a bright future before the Company. He had prophesied this for fifty years; and he still predicted that their future would be as bright as the past had been.

Mr. A. W. Oke, in seconding the motion, warmly congratulated the Directors on the fact that the Bill had passed without any opposition from the Corporation of Eastbourne. This showed, he said, that good relations existed between the Directors and the Town Council. He looked forward to a very large increase in the sale of gas, which would not only provide the full dividends, but a substantial surplus, enabling the Company to avail themselves of the provisions of the new Act. Not only would Eastbourne be supplied with gas at a very low rate, but the country districts—especially Hailsham—would receive gas at prices that perhaps they scarcely dreamed of a short time ago.

The motion having been carried, the dividends were declared.

Thanks were then accorded to the Directors, officers, and workmen, for the care with which they had conducted the affairs of the Company, as shown by the accounts and by the growth and progress made.

The Chairman having briefly acknowledged the vote,

Mr. H. E. Jones (the Company's Consulting Engineer) also responded. He expressed his pleasure at being associated with so prosperous a Company. This prosperity, he assured the proprietors, arose entirely from boldness in reducing the price of gas. With regard to the general prospects of the Company, the Chairman had alluded to them as being bright; and he (Mr. Jones) could fully confirm this. He could assure the proprietors that at the present moment, without any fantastical new experiments or new ideas, the old-fashioned kind of retorts they had were worked in the special manner which had lately been adopted—maintaining a longer period for charges, and filling better by machinery. They must no longer be contented with producing the quantity of gas per ton of coal they had been making. Not only would they be able to make better coke, but a great deal more of it. The Directors never refused the officers any productive outlay they asked for; and he ventured to prognosticate that the returns would be largely extended in the near future.

The Chairman, responding to a vote of thanks to himself, referred to

the Company's increased area, and said they took gas to Hampden Park and Willingdon, where there was a full supply. During the last few weeks Polegate had been served, and he was told that the demand was very satisfactory. They had 40 consumers, all of whom were using gas for cooking, and they had 60 applications. They were going on to Hailsham—they were half-way there—and by the end of September or October they would be supplying that market town with good gas at 2s. 11d. per 1000 cubic feet, against the 5s. 3d. now being paid there.

PROVINCIAL WATER COMPANIES.

During the past few weeks, meetings have been held of many Provincial Water Companies; and we give below the points of general interest from reports of some proceedings which have come to hand.

Barnstaple.—Mr. C. E. R. Chanter presided at the last half-yearly meeting of the Barnstaple Water Company, and congratulated the shareholders on the steady progress of the undertaking. The water-rate for the half year was £1929, compared with £1916 for the corresponding period of last year. There was an increase from £75 to £134 in the expenses of repairs and maintenance, owing to the large amount of work done at the old filter-beds. Satisfactory results had followed the alteration of the filtering arrangements. A waste-water meter had been installed, and had led to a large number of repairs to the mains being carried out. The Directors had made their customary yearly inspection of the works, and found them in a thoroughly efficient state. The engines and boilers which were put down in 1889 were in practically as good a condition as they were at that time. An extension of mains had been made to Bishop's Teignton, to meet the wishes of residents. This might not prove immediately profitable; but he had no doubt that the people would be glad to avail themselves of the facilities which the Company were in a position to afford, and that ultimately a very satisfactory income would be derived from this place. The accounts showed that there was a balance of £2174 to the credit of the profit and loss account; and dividends of 10s. each on the original shares and 7s. on the "B" shares were declared.

Chester.—There was a sum of £2255 available for distribution at the 105th half-yearly general meeting of the Chester Water Company; and the Directors recommended the payment of the usual statutory dividends, which would absorb £2077. Reference was made in the report to the death of Mr. Crowe, who had been for 38 years the Company's Engineer; and it was mentioned that the works were under the care of Mr. C. W. Bennett. The Chairman (Mr. F. E. Roberts), in moving the adoption of the report, said that the Company had had a quiet and peaceful half year, and the Directors had little to tell the shareholders. They had one sad event to mention, and that was the death of Mr. Crowe, who had been a tower of strength to the Company for many years, owing to his very able management of the part of the undertaking which came under his supervision. The Directors had made temporary arrangements for the engineering department. Mr. Bennett, who had been a good many years in the service of the Company, was now in charge of the works, subject to the kind supervision of a Consulting Engineer, who would help him in any difficulty, and confer with him as occasion arose. He (the Chairman) would like to express the feeling of regret they all shared that the citizens of Chester were losing the services of Dr. Thomas as Medical Officer of Health. Their experience of him was that he had shown himself most able in the management of his department, and their dealings with him had always been pleasant and without friction. Dr. Thomas had kept a lynx eye on the water-works during the past year; and his verdict was that the "Chester water supply is generally of exceptionally good quality." They were glad to find Dr. Thomas's analyses confirmed those made by the Company's officers and experts for their own guidance. With regard to the dispute with the Guardians, he was glad to tell the shareholders that the Company had lately received between £800 and £900 from them in respect of costs. This was only a part of the large expenditure to which this litigation had unfortunately given rise. They had lately appealed to the Master on a question which affected the main and vital question at issue; and he had decided in the Company's favour. They appealed to a Judge, who did likewise; and now they were going to the Court of Appeal on it. The report was adopted; and dividends were declared at the following rates: 7½ per cent. per annum on the consolidated stock, 6 per cent. per annum on the perpetual 6 per cent. preference shares, and 7 per cent. per annum on the new ordinary stock, 1874.

East Worcestershire.—In the report presented at the half-yearly general meeting of the East Worcestershire Water Company last Thursday, the Directors stated that 83 additional services had been laid on in the six months ended the 30th of June; making the total 7581, exclusive of the districts supplied in bulk. The Directors had carefully considered the question of increasing the yield of water at Burcot, and had decided to sink a shaft near No. 3 borehole, and to be connected therewith at a depth of 100 feet. When this was completed, the borehole, which was 400 feet deep, could be carried farther, possibly into the pebble beds. The revenue account showed a balance of profit amounting to £2430, which, with the carry-forward, made a disposable sum of £3274, which it was proposed to appropriate as follows: To pay a dividend for the half year at the rate of 5 per cent. per annum, free of income-tax, £1831; provide for depreciation on buildings, machinery, and mains, £600; and carry forward the balance, £843. The report was adopted.

Frimley and Farnborough.—At the 32nd half-yearly meeting of the Frimley and Farnborough District Water Company, the Directors reported a balance of £5076 on the revenue account for the half year ended June 30. After paying debenture interest and adding the sum of £7245 brought forward, there was left a disposable balance of £11,820. Out of this the Directors recommended a dividend for the half year at the rate of 7 per cent. per annum, carrying forward £8207. During the six months, 147 additional houses and 14 meter connections had been made, and the service-mains had been extended about 1¼ miles. The new subsiding reservoir at the Frimley pumping-station, with a capacity of 783,000 gallons, was completed; and the embankments for two others were well forward. By their new Act the Company's area would be extended over 17 parishes; and the deep well and pumping-station at Greywell, the high-level service reservoir at North Warnborough, and other works, were authorized. The capital would be increased by £70,000, with the usual borrowing powers. In moving the adoption of the report, the Chairman (Alderman C. Pain, J.P.) reminded the proprietors that some time ago the Company purchased 6 acres of land at Greywell, under the roving powers clause in their Act, and proposed to sink a well on it; but they were stopped by injunction. Hence the necessity for going to Parliament. He was glad to say they were successful in carrying their Bill through the House of Lords, and no opposition was offered in the Commons. The area of the Company's district prior to the Bill passing was 78 square miles; and it would now be increased by 49 square miles, besides the area over which the Company supplied water to the Wey Valley Company—38 square miles—making a total of 165 square miles. The works proposed were the completion of the well at Greywell and the construction of a reservoir at South Warnborough, which would be of the same level as Heathy Park reservoir—viz., 610 feet above Ordnance datum. From these and the other reservoirs, it was hoped to be able to tide over the difficulties that had arisen in the past. Mr. H. J. B. Hollings, in seconding the motion, said the shareholders owed a debt of gratitude to the Chairman for his work in connection with the Company's Bill. Mr. Temple Cooke said he was glad to bear testimony to what had been stated by Mr. Hollings with regard to Mr. Pain's work. Had it not been for the Chairman, he very much doubted whether the Bill would have passed. The motion having been carried unanimously, Mr. E. K. Burstal was elected an Auditor of the Company in succession to Mr. T. B. Forwood, who had become a Director; the Chairman remarking that Mr. Burstal was an experienced water-works engineer, aad that the Company were fortunate in obtaining his services. He also thanked his colleagues on the Board and the shareholders for their expressions with reference to his work in connection with the Bill.

Grantham.—The accounts which the Directors of the Grantham Water Company presented at the recent half-yearly general meeting showed a balance on the revenue account for the six months ended June 30 of £12,240. They proposed that £2000 should be applied in payment of a dividend at the rate of £10 per cent. per annum for the past half year, and that the balance of £10,240 should be carried forward. In proposing the adoption of the report, the Chairman (Mr. J. G. Thompson) said there had been a diminution in the revenue of the Company for the half year, compared with the corresponding period of 1908; but this did not take them by surprise when they remembered the amount of rain there had been. Another reason was the state of trade in the town, which had been depressed. But from the meter reports since the half year had turned there had apparently been a decided revival; and he hoped the town would now see prosperity. The Chairman referred to the new sedimentation reservoir which had been erected, with a capacity of 70 million gallons, and said the work had been completed most satisfactorily, and reflected the greatest credit on their Engineer (Mr. H. Preston) and the Consulting Engineer (Mr. W. Matthews). With reference to the Company's new parliamentary powers, he would say, to prevent any misconception on the part of the shareholders, that it was not the intention of the Directors to issue fresh capital, as the money required by the Company would be raised by debentures. Mr. H. M. Escritt seconded the motion; and the report was adopted.

Maidstone.—At the half-yearly meeting of the Maidstone Water Company, the Directors reported that the water-rents in the six months ended the 30th of June amounted to £6828, being an increase of £49 compared with the corresponding period of 1908, and that there was a sum of £8073 to the credit of the profit and loss account. They recommended a dividend (free of income-tax) for the half year at the rate of 7½ per cent. per annum on the 10 per cent. shares, and at the rate of 5¼ per cent. per annum on the 7 per cent. shares; also that £3000 should be transferred to a contingency account, leaving £3339 to be carried forward. In moving the adoption of the report, the Chairman (Mr. W. H. Bensted) said there had been an increase in the rates for domestic services; but the revenue from the supply by meter was practically the same as in the past half year. They could not hope for any great increase in revenue until the town was in a more prosperous condition; there being a great number of empty houses. The motion was carried. A report was read from Dr. Sims Woodhead, the Company's bacteriological expert, to the effect that he found on the 6th of July that the conditions under which the water was gathered and stored were excellent. He had visited all the gathering-grounds, &c., in company with Dr. Howarth (the County Medical Officer), Dr. C. Pye Oliver (Medical Officer of Health for Maidstone), and the Company's Engineer (Mr. W. Ware).

South Essex.—In moving the adoption of the report of the Directors at the ordinary meeting of the South Essex Water-Works Company, the Chairman (Mr. Courtenay C. S. Fooks) said the Company had had a very successful half year; the profit amounting to £15,510, against £14,747 for the corresponding period of 1908. They had earned almost enough to pay their maximum dividends; but they thought it not advisable to do so at present, because it meant that they would automatically have to reduce at once the price of water to houses of less than £30 annual value. Until they saw their way to continue to pay the maximum dividends, they considered the wiser course was to conserve the Company's finances and proceed a step at a time. Rates and taxes showed an increase of £600 for the six months. So long as there were municipal undertakings in the district, such as electric lighting works and electric tramways, which were not run at a profit, the ratepayers would have to make up any deficit; and as the second largest ratepayers, the Company were rather heavily hit. It seemed to him a wrong state of things that those who had to pay the greater part of the rates should have no voice in the spending of the money. The Board were advised that, with the completion of the Seven Kings' well and the Dagenham well, a sufficient supply of water would be provided for the district in advance of the ordinary growth of the population. The motion was carried. The proposed dividends on the ordinary

stocks 1861, 1882, and 1901, at the rates of £9 15s., £6 16s. 6d., and £4 17s. 6d. per cent. per annum, were agreed to.

South Hants.—The half-yearly ordinary general meeting of shareholders in the South Hants Water Company took place last Friday, at the offices in Southampton, under the chairmanship of Mr. W. E. Darwin, J.P. The report presented showed that since the last meeting the rent roll had been increased by the addition of 308 houses, representing a rental of £626; while the balance on the profit and loss account had been raised to £9393. The remarks of several speakers emphasized the gratifying progress of the undertaking; and it was agreed that the interim dividend should be at the maximum rate on each class of ordinary shares—viz., 10, 7, and 5 per cent.

Wrexham.—The statement of accounts submitted at the annual meeting of the Wrexham and East Denbighshire Water Company showed that the expenditure for capital purposes had been £3574, which, the Directors explained in their report, included payments in respect of the new reservoir at Ty Mawr and for extensions of mains carried out under an agreement with the Hawarden Rural District Council. The storage reservoir at Ty Mawr had been completed, and brought into use. By the construction of this work, which had occupied the attention of the Directors for six years, the Company were enabled to meet the increasing requirements of the district without having recourse to pumping. The necessity for further addition to the filtering capacity of the works had been under consideration, and the construction of a new filter-bed had been undertaken. This would enable the Company to meet future demands and maintain the high quality of the supply. Receipts on revenue account (£11,486) showed an increase of £359 compared with the preceding year, and of £966 compared with 1907. During the year water had been laid on to 226 houses, making a total of 6835 houses now supplied. After payment of the usual charges, the dividend upon the preference stock, the interim dividends at 6½ per cent. per annum upon the consolidated stock and £4 11s. per cent. per annum upon the ordinary stock for the half year ended Dec. 31 last, and interest upon mortgages and debenture stock for the year, a balance remained of £8629. The Directors accordingly recommended the payment for the half year of the preference dividend, and also dividends at the rate of 6½ per cent. per annum upon the consolidated stock, and £4 11s. per cent. per annum on the ordinary stock, all free of income-tax. The Chairman (Mr. J. Alington Hughes), in moving the adoption of the report, pointed out that rates and taxes still headed the expenditure, amounting to £1328 out of a total working charge of £3300, or no less than 40 per cent. Mr. Frederick Storr, the Company's Engineer and Secretary, acknowledging a vote of thanks to the officials, mentioned that the Ty Mawr reservoir contained 134½ million gallons of water, and there was room to make the storage up to 170 millions.

DEFECTIVE LIGHTING OF MANCHESTER SCHOOLS.

It would seem, from a communication published in the "Manchester Guardian," that the lighting of many of the public schools in the city leaves much to be desired. The correspondent says: "A week ago I had to take refuge from the sudden storm in the doorway of one of our city schools. Though it was early in the morning of a summer day, the building was temporarily plunged in darkness, and recourse had to be had to artificial light. Imagine my surprise when I discovered that the lighting equipment for a large class consisted of only two branches, each suspended a good way above the heads of the scholars, and bearing a few ordinary gas-jets, which emitted but a dim light. No wonder the poor children had to stoop uncomfortably over their work." The correspondent alleges that this state of affairs is pretty general in Manchester schools, and he recalls that last winter the officials of the Corporation admitted that the illuminating power of the gas had been reduced; it being expected, however, that this would be more than compensated for by the use of incandescent mantles. He expresses the hope that, as winter is at hand, when a part, at least, of the day's work will have to be done by the aid of gaslight, the authorities will see to it that incandescent mantles are fixed in all the schools.

GERMAN TRADE IN GAS PLANT AND APPARATUS IN 1908.

The annual report of the Berlin Chamber of Commerce for the year 1908 comprises two volumes, in the second of which different branches of industry are reviewed in detail. The "Zeitschrift für Beleuchtungswesen" has recently contained a series of articles giving extracts from this report in so far as it concerns the lighting and heating industries.

It is mentioned that very large imports of gas coke took place from England, and incidentally contributed to the lowering of the price of coke which occurred within the course of the year. There was a large increase in the amount of petroleum imported from Austria, partly accounted for by the fact that there was a great improvement in the quality of the oil from this source. The gas oil imported amounted to more than double the quantity brought into Germany in the previous year, and it came almost exclusively from Austria-Hungary. The greater part of it was destined for carburetting illuminating gas. There was generally an appreciable reduction in the price of petroleum products. The chief raw materials for mantle manufacture remained at practically the same prices as in the previous year, although some of the auxiliary materials were distinctly cheaper. The selling price of the products was, however, depressed; and, owing to the general industrial conditions, the demand was not great.

The industry has benefited by technical improvements; but considerable uneasiness was caused by the project for the taxation of gas and electricity, and in particular by the tax on mantles. There was some improvement in the business done in gas and water fittings; but ultimately prices fell in sympathy with the reduction in the cost of raw materials. It is pointed out, with reference to the construction of gas-works and the manufacture of gas-works plant and apparatus, that this branch of industry has the advantage of a continuous increase year by year in the number of gas-works in the world. Fresh towns constantly decide to introduce gas supply, either by building their own works or obtaining gas from the nearest existing ones. In either case new plant is required. On the whole, business in gas-works plant and apparatus was satisfactory during the past year, and raw materials were obtainable at lower prices than previously. So far as export from Germany was concerned, it is reported that the tariffs in operation in most countries prevented much business being done with them. In particular, importation of gas-works apparatus into Austria was practically brought to a standstill by the prohibitive duty of £1 per 100 kilos. weight. The conditions for export to countries lying beyond the Continent of Europe were more favourable, and a number of large commissions were obtained. The prices, however, were somewhat low. At home activity in the manufacture of gas-works plant and apparatus was towards the end of the year somewhat checked by the promulgation of the scheme for the taxation of gas.

SALE OF GAS COKE IN FRANCE.

Managers of gas-works have always experienced difficulty in selling their coke; and it is not rare to see large accumulations which are a real encumbrance to the works. They have consequently long been endeavouring to find some means to assist the sale of this fuel. Association was clearly what was needed, and combinations of gas-works were formed in different districts in France. Of course, it is the northern and Paris group which is the most important, comprising as it does about 140 works. It is pointed out in the "Echo des Mines" that, notwithstanding this *entente*, the difficulties in the sale of coke have persisted. It was accordingly decided to form a new organization comprising nearly all the gas-works in France, which number about 700. Matters, however, are not yet settled, as some of the works continue independent. The organizers do not pretend to disguise from themselves the difficulties to be overcome. At the present time there is great disorder in the district organizations, and it is quite rare for works to furnish the sales office with the quantities of coke they undertake to supply every fortnight. In fact, it is not a question of selling all the coke produced in the works in the group, but simply what is left after the needs of the works have been supplied. However, an understanding on the matter will be come to very shortly.

Meanwhile, a limited liability company has been formed in Paris, under the title of "L'Office des Cokes," the principal object of which is to extend the use of coke for domestic purposes. It is stated that the Company has been started by the city coal dealers; and it is thought that by replacing the leading gas companies of the Seine, it will render great service to all. The consumers will obtain favourable prices owing to the centralization of orders and to securing the best terms of delivery; the gas-works and their workmen will be benefited by having an assured market for their products; and the collieries will not suffer from a fall in coke, which could not fail to affect the price of coal.

FOREIGN PATENTS IN ENGLAND.

The Patents and Designs Act, 1907, came into force on the 28th of August last year so far as regards section 27, which deals with the revocation of patents worked outside the United Kingdom. At the end of last week, therefore, this portion of the Act had been in operation for exactly twelve months. The Act gives power to any person to apply to the Comptroller-General for the revocation of a patent, after it has been in existence four years, on the ground that the patented article or process is manufactured or carried on exclusively or mainly outside the United Kingdom. According to an article in "The Times" last Thursday, during the year which has elapsed since the above-named section came into force, 69 applications for revocation of foreign patents were made to the Comptroller-General; and in ten cases only were patents revoked by him. In four of them the patentees appealed to the High Court; and in two cases relating to improvements in electric arc lamps, the decision of the Comptroller-General was reversed, evidence having been adduced which was not placed before him, the effect of which was to show that the patented process was being adequately carried on in this country. The two other appeals to the High Court were unsuccessful, so that the number of patents finally revoked was eight. Four applications were dismissed by the Comptroller-General, in addition to the two cases in which his decisions were reversed. No fewer than 28 applications were withdrawn after they had been lodged—in many cases, it is understood, because evidence was forthcoming of "adequate" working. There remain 26 cases which are still officially pending, though in one or two instances the applications have lapsed through effluxion of time.

Our contemporary remarks that it is too early yet to say whether the new power of revocation conferred by the Act of 1907 is likely to have any appreciable effect in reducing the number of foreign patents taken out in this country. In the first seven months of the present year, there were 17,869 such patents applied for—an increase of 1566 compared with the corresponding period of 1908, though only an increase of 319 upon the larger figures for the first seven months of 1907. Sixteen fewer patents were taken out in 1909 by American subjects than in 1908, and 331 fewer than in 1907. The decrease in German patents has been consistent—2000 in 1907, 1822 in 1908, and 1735 in 1909; and the same may be said of Austrian patents—253, 234, and 192 respectively. French patents, which were 620 in 1907 and 670 in 1908, decreased to 560 in 1909.

In Melbourne last Wednesday the verdict was given in a libel action brought by Mr. Swinburne, who was Minister of Water Supply and afterwards Minister of Agriculture in the Victorian Cabinet under Sir Thomas Bent, against the "Melbourne Age," on account of some reflections on his alleged conduct in connection with tenders for water supply. The plaintiff claimed £5000 damages; and he was awarded a sum of £3250.

HALIFAX AND THE WALSHAW DEAN RESERVOIRS.

Reducing the Leakage.

On the invitation of Mr. Mark Crossley, the Chairman of the Halifax Water Committee, the members of the Town Council last Tuesday paid a visit to the Walshaw Dean reservoirs of the Corporation. These reservoirs were formally "opened" nearly two years ago; but up to the present time no water has been taken from them for supplying the town. They consist of three stretches of water; and leakages have been discovered at both the lower and the middle embankments. The Engineers (Messrs. G. H. Hill and Son, of Manchester) are engaged at the present time in endeavouring to stop the crevices through which the water escapes, by grouting with liquid cement through boreholes in the embankments. So far the expenditure on this work has amounted to from £3000 to £4000.

In the course of the inspection, Mr. G. H. Hill explained that at first there was a small leakage of about 10,000 gallons a day at the embankment of the lower reservoir; but suddenly, in one night last April, it increased to 400,000 gallons a day, though the level of the water in the reservoir was just the same as before. Since April, they had been grouting; and the leakage was now 115,000 gallons per day. The water in the reservoir had been kept at 12 feet from top-water level; and when raised a further 2 inches, the leakage had not increased. Therefore he considered that the results of the grouting operations were very satisfactory. They were going to increase the grouting down the shaft at the lower embankment; and he thought they would secure a further reduction, but they would have to put fresh holes in the side of the shaft. Some 50 tons of cement had been put down the shaft; and they had not been able to trace any of this coming out with the leakage on the other side of the embankment. In the lower heading, which was below the shaft he had referred to, there were two fissures; but these had been made good with 12 tons of liquid cement. As soon as they had done all they could at the lower embankment, they would deal in the same way with the leakage near the valve shaft at the middle embankment. In the meantime, he might say that whatever water did escape at the lower reservoir was not lost by the Corporation, as it went towards the 1½ million gallons of compensation water which had to be turned down the stream every day. However, they had to look to the safety of the works, though so far the leakage did not affect their safety—the water was all going through the rocks. The Executors of the Contractor, the late Mr. Enoch Tempest, had received the authority of the Court to make up the subsidence of the embankments; and when this had been done, the water in the reservoirs could without any danger be raised to top-water level. The subsidence in the embankments was only the ordinary settlement, except at the point near the valve-shaft on the middle embankment, where there was a leakage. There need be no fear whatever that the embankment itself was becoming undermined. At the most, the settlement in the embankment was 2 ft. 6 in.; and this was nothing unusual.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The new gas-works at Fauldhouse, to which I more than once made some reference while they were in course of construction, were formally opened on Tuesday afternoon. For the ceremony, a company of about 120 invited guests assembled. They were shown over the works, and had them explained to them by the Engineer—Mr. T. Wilson, of Coatbridge. Thereafter, Mr. James Wood asked Mrs. Prentice, the wife of the Chairman of the Gas Company, to turn on the gas to the town. This having been done amid applause, Mr. Prentice asked the company to adjourn to St. James's Masonic Hall, where refreshments were served. Several toasts were given, including "Success to the Gas Company." In the name of the Contractors and himself, Mr. Wilson presented Mrs. Prentice with a beautiful pearl brooch as a memento of the occasion. The proceedings were wound up by a concert. The works cover an acre of ground, and have a siding running into them from the North British Railway. The retort-house is large and roomy. In the retort-bench there are three ovens, with two, four, and six retorts respectively; and there is space for another oven of eight retorts. Under the same roof is a coal-store, capable of holding 300 tons. There are a vertical condenser, two purifiers 10 feet square, a station-meter, a spiral-guided gasholder, a Foulis underground governor, a suite of offices and workshops, and two weighbridges. The Company start business with over 200 consumers, and 64 public lamps which are fitted with the lighting and extinguishing controller of Messrs. Alder and Mackay, of Edinburgh. The ironwork of the retort-house, the condenser, and the purifiers were supplied by the Barrowfield Iron-Works, Limited, of Glasgow; the gasholder and steel tank, by Messrs. Robert Dempster and Sons, Limited, of Elland; the station-meter, by Messrs. R. Laidlaw and Son (Edinburgh), Limited; the governor, by Messrs. James Milne and Son, Limited, of Edinburgh; the consumers' meters and street lanterns, by Messrs. Alder and Mackay; and the steam-boiler, tar-tank, pump, and weighbridges, by Messrs. Dick-Clelland and Harper, of Glasgow.

I have on more than one occasion commented on the unsympathetic attitude adopted by the officials of the Scottish Office towards the promoters of local legislation. Expression is given to views similar to my own by a Sub-Committee of the Corporation of Greenock, in a draft report to the Town Council regarding the Provisional Order which they recently acquired. The Sub-Committee are of opinion that a great deal of unnecessary trouble and expense was caused by the Scottish Office, whose finical objections seemed eventually to become somewhat tiresome even to the members of the Parliamentary Committee who dealt with the Bill. From time to time, the report states, a Corporation like that of Greenock are in want of capital for new undertakings; and, generally speaking, before authority to borrow can be obtained, the Secretary for Scotland has to give his consent. On several occasions, the Scottish Office complained of the intricate legislation applicable to Greenock; and in the case of a recent loan, it was made

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 559.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17¾—18¼	..	5 9 7
298,955	10	,,	7	Do. 7 p.c.	12½—13	..	5 7 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd.. . . .	5⅝—5⅞	..	5 10 8
40,000	5	,,	6½	Do. New, £4 paid .	4 7/16—4 11/16	+1/16	5 11 0
50,000	10	Aug. 26	15	Bournemouth Gas and Water 10 p.c. . .	28—28½*	..	5 5 3
311,810	10	,,	7	Do. B 7 p.c. .	16¼—16¾*	..	4 3 7
75,000	10	,,	6	Do. Pref. 6 p.c.	15⅜—15⅝*	..	3 16 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	250—253	..	4 18 10
300,000	,,	,,	9½	Do. New . . .	190—192	..	4 19 0
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122	..	4 2 0
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	100—102	..	3 18 5
220,000	Stk.	Mar. 12	11†	Brighton & Hove Orig.	213—215	..	5 2 4
246,320	,,	,,	8†	Do. A Ord. Stk. .	154—156	..	5 2 7
460,000	20	Apl. 16	10	British	43—43½	..	4 11 11
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c. . .	117—119*	+1	5 0 10
165,700	,,	,,	4½	Do. B 3½ p.c. . .	88—90*	+1¼	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c. . .	106—108*	+¾	5 1 10
5?,000	,,	June 25	3½	Do. 3½ p.c. Deb. .	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13½—14	..	5 0 0
250,000	Stk.	June 25	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord. . .	106½—108½	..	4 12 2
1,493,280	Stk.	Aug. 26	5 2/10	Commercial 4 p.c. Stk. .	107—109*	+½	4 15 5
560,000	,,	,,	5	Do. 3½ p.c. do. .	103—105*	+½	4 15 3
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	95—97	..	5 3 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
492,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord. .	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd. . . .	24½—25	..	4 16 0
354,060	10	,,	12	Do. £7 10s. paid.	18½—19	..	4 14 9
5,141,545	Stk.	Aug. 12	4⅔	Gas light and Coke 4 p.c. Ord. . .	104—105	..	4 8 10
2,600,000	,,	,,	3½	Do. 3½ p.c. max. . .	87—89	..	3 18 8
3,799,735	,,	,,	4	Do. 4 p.c. Con. Pref.	103—105	..	3 16 2
4,193,975	,,	June 11	3	Do. 3 p.c. Con. Deb.	85½—86½	..	3 9 4
258,740	Stk.	Mar. 12	5†	Hastings & St. L. 3½ p.c.	93—95	..	5 5 3
82,500	,,	,,	6½†	Do. do. 5 p.c.	118—120	..	5 8 4
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17¾—18¼	..	6 0 7
131,000	Stk.	Mar. 12	6½	Ilford A and C . . .	141—143	..	4 10 11
65,780	,,	,,	5	Do. B	106—108	..	4 12 7
65,500	,,	June 25	4	Do. 4 p.c. Deb. . .	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental .	179—181	..	4 8 5
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 11

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c. .	118—120*	+1	5 0 0
561,000	Stk.	,,	10	Liverpool United A. .	223—225*	..	4 8 11
718,100	,,	,,	7	Do. B . .	164½—166½*	..	4 4 1
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean.	4⅞—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met. of Melbourne 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Do. 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 27	3½	Monte Video, Ltd. . .	12½—13	..	5 7 8
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	106½—107½	..	4 3 9
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	92—93	..	3 12 2
55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13—13½*	+½	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	139—141	..	5 13 6
60,000	5	Mar. 31	8	Ottoman, Ltd. . . .	6⅛—6⅜	..	6 5 6
3?,800	53	Aug. 26	13	Portsea Island A. . .	137—139*	..	4 19 0
60,000	50	,,	13	Do. B. . .	129—131*	..	4 19 3
100,000	50	,,	12	Do. C. . .	120—123*	..	4 17 7
114,800	50	,,	10	Do. D and E.	101—103*	..	4 17 1
398,490	5	May 13	7	Primitiva Ord. . . .	6⅞—7⅛	..	4 18 4
796,980	5	July 29	5	Do. 5 p.c Pref. .	5¼—5½	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
1,000,000	10	Apl. 29	8	River Plate Ord. . .	16¾—17¼	..	4 12 9
312,650	Stk.	June 25	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	14¼—14¾	+¼	5 8 6
62,500	10	,,	6	Do. 6 p.c. Pref. .	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49½—50½	..	4 19 0
135,000	Stk.	Mar. 12	10	Sheffield A	231—233	−5	4 5 10
209,984	,,	,,	10	Do. B	231—233	−2	4 5 10
523,500	,,	,,	10	Do. C	231—233	−1	4 5 10
70,000	10	June 11	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Aug. 12	5⅓	South Met., 4 p.c. Ord.	119—121	..	4 8 1
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	84½—85½	..	3 10 2
209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	150—152*	+1	5 5 3
605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	118—120	..	4 11 8
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord. . .	110—112	..	4 9 3
120,000	Stk.	Aug. 12	6⅞	Tottenham and Edmonton A 5 p.c. .	130—132	..	5 4 2
453,940	,,	,,	5⅜	Do. B 3½ p.c. .	109—111	..	4 16 7
149,470	,,	June 25	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109—111	..	4 10 1
255,636	Stk.	Aug. 26	6⅝	Wandsworth B 3½ p.c. . .	138—140*	+1½	4 14 8
79,416	,,	June 25	3	Do. 3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	,,	Aug. 12	5⅜	West Ham 5 p.c. Ord. .	124—126	..	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref. . .	127—129	..	3 17 6
253,300	,,	June 25	4	Do. 4 p.c. Deb Stk..	112—114	..	3 10 2

Prices marked * are "Ex div." † Next dividend will be at this rate.

an express condition that Greenock should consolidate its local statutes. A Provisional Order was prepared for this purpose, and was in the hands of the Scottish Office for eighteen months before it came up for consideration by the Parliamentary Committee. Yet it was only a fortnight before the Bill had to be dealt with in London that the Scottish Office lodged a long report, the substance of which was that where there was general legislation similar to local legislation the former should be adopted. The difference between incorporation and adoption, the Sub-Committee state, will probably seem to most people sufficiently slight; and yet it was a subject to which the Scottish Office, as it eventually turned out, was disposed to attach considerable importance. In the case of officials, the time and expense which such discussion caused a corporation appeared not to be taken into account; and the result was an amount of delay which was certainly not contemplated by the town's Parliamentary Counsel and Agent, who were responsible for the drafting of the Bill.

In the report of the Sub-Committee, there is some reference to the expense which has been entailed upon the promoters by objecting petitioners. This has brought the Town Council of the neighbouring burgh of Port-Glasgow into the field, with a series of explanations as to their reasons for opposing the Greenock measure. They explain that the controversy between them and Greenock arose through (1) an attempt by the Greenock Corporation to invade Port-Glasgow's territory and supply electricity, water, and gas without any leave; (2) an attempt to deprive the Council of their rights in connection with the supply of electricity to the Tramway Company; and (3) Greenock's action in adding and having passed by the House of Commons Committee, without any notice, a proviso defeating absolutely the right of the Port-Glasgow Town Council, after having reinstated that right by inserting an agreed-on clause. The Port-Glasgow Town Council, it is pointed out, aimed at nothing more than the maintenance of the *status quo*; and though the Greenock Corporation knew this, from the date of the publication of their Order about sixteen months ago, they compelled the Port-Glasgow Town Council to incur the cost of an opposition to attain their object.

Harrow and Stanmore Gas Company.—At the half-yearly meeting of this Company next Monday, the Directors will report the continued prosperity of the undertaking; there having been a considerable increase in the sale of gas in the six months ended the 30th of June, though the value of residuals had been much depressed. The accounts accompanying the report show a sum of £9627 available for distribution; and the Directors recommend dividends at the rate of £10 10s. per cent. per annum on the "A" capital, £7 7s. per cent. on the additional "C" capital, and £7 per cent. per annum on the additional "B" capital and guaranteed shares, all less income-tax; also that £317 5s. should be placed to the reserve fund, being surplus profits under the sliding-scale not declared in the dividends. This will leave £4344 to be carried forward.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Aug.* 28.

The improvement in the tone of the market remarked upon a week ago has been sustained, and at several points a further advance in prices has been scored. Demand has, however, been primarily for the purpose of completing contracts for August shipment; but August prices have also been paid for September delivery. The closing quotations are £11 2s. 6d. to £11 3s. 9d. per ton f.o.b. Hull, £11 3s. 9d. to £11 5s. per ton f.o.b. Liverpool, and £11 6s. 3d. to £11 7s. 6d. per ton f.o.b. Leith. For delivery up to the end of the year, the ideas of buyers are not over £11 7s. 6d. per ton f.o.b., and there is no great eagerness to purchase in this position. For January-June, January-August, and over the whole of 1910, £11 10s. per ton f.o.b. Leith has been paid; but no higher price has been reported.

Nitrate of Soda.

This market continues without change at 9s. 6d. per cwt. for ordinary quality, and 9s. 9d. for refined.

Tar Products. LONDON, *Aug.* 30.

The markets have been steady during the past week; but there has not been a large amount of business doing, and it is doubtful whether there will be any great revival for some weeks to come. Pitch is very firm indeed. Manufacturers report that they are receiving offers at advanced prices; but in the majority of cases they are declining these, owing to the fact that they have little or none to dispose of. Creosote is very quiet, and prices show a tendency to become still easier. Benzol is steady, though there is not very much business doing; the majority of buyers wishing to purchase for delivery over a long period ahead, to which makers will not consent. Toluol is firm, and in good demand. Solvent naphtha is steady in London, but is quiet in the North. There is little demand for heavy naphtha. Carbolic acid is exceedingly quiet, and sales are reported at very low prices for both prompt and forward delivery. Refined naphthalene is quiet; but salts are in fair demand.

The average values during the week were: Tar, 15s. 9d. to 19s. 9d., *ex* works. Pitch, London, 29s. 6d. to 30s.; east coast, 29s. 3d. to 29s. 6d.; west coast, 28s. 6d. to 29s. 6d. f.a.s. Mersey ports, 28s. to 28s. 6d. f.o.b. other ports. Benzol, 90 per cent., casks included, London, 6½d.; North, 5¾d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6¼d. to 6½d. Toluol, casks included, London, 8¾d. to 9d.; North, 8¼d. to 8¾d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3⅛d.; solvent naphtha, casks included, London, 10¾d. to 11¼d.; North, 9¾d. to 10d.; heavy naphtha, casks included, London, 10½d. to 10¾d.; North, 9½d. to 9¾d. Creosote, in bulk, London, 2¾d.; North, 2¼d. to 2⅝d. Heavy oils, in bulk, 2⅞d. Carbolic acid, 60 per cent., casks included, east coast, 10½d. to 10¾d.; west coast, 10¼d. to 10½d. Naphthalene, £4 10s. to £8 10s.; salts, 35s. to 40s.,

packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been steady throughout the past week, and prices show a tendency to harden all round. The Gas Companies maintain their quotation of £11 7s. 6d.; but at this figure they are still unable to do business, though there are signs that before very long they will be able to pass contracts at this price. The outside makes upon Beckton terms are selling for prompt delivery at £11 1s. 3d. to £11 2s. 6d. Business is reported in Hull at £11 2s. 6d. for prompt for a good make, and in Liverpool at £11 3s. 9d.; while in Leith, £11 6s. 3d. to £11 7s. 6d. is asked.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a continuance of the fall in the price of steam coals, until some qualities are about 4s. 6d. per ton lower than they were at the end of last month—a very sharp fall. Best Northumbrian steams are now quoted from about 10s. 6d. to 10s. 9d. per ton f.o.b., with a moderate demand. Second-class steams are about 10s., and steam smalls are from 5s. to 6s. The collieries are not working very fully; there being only a moderate export at present. In the gas coal trade, the demand is relatively brisk, with steady prices. Durham gas coals are quoted, according to quality, from about 10s. to 11s. 4½d. per ton f.o.b. for the usual classes, and up to 11s. 9d. for "Wear specials." Sales continue to be made of coal for shipment over a few months ahead to some of the ports of the Mediterranean; and for these good prices seem to be realized. About 10s. 3d. per ton for second-class gas coal appears to be the medium price in these sales; and for best Durham gas coal, from 17s. per ton, at Genoa, is believed to have been paid, for some 60,000 tons, over twelve months. At the same time, some producers do not seem to wish to sell far ahead until the hours question is more settled in the county of Durham. Coke is steady; and the output of gas coke is increasing. The price, however, appears to be steadily maintained at 12s. 9d to 13s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The coal market remains unchanged, except that in the case of ell, which is very plentiful, the price is easier. Splint is in fair demand. There is a disposition on the part of buyers to contract forward, the state of the market being considered favourable for this form of dealing. The prices now quoted are: Ell 9s. 3d. to 10s. 6d., splint 10s. 3d. to 10s. 6d., and steam 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 342,397 tons—an increase of 23,303 tons upon the previous week, and of 17,528 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,464,803 tons—an increase of 528,777 tons upon the corresponding period.

Electric Street Lighting at Maidstone.

When moving the adoption of the Electricity Committee's report at the monthly meeting of the Maidstone Urban District Council, Alderman Vaughan remarked that, at the recent meeting of the Maidstone Gas Company, the Chairman (Mr. George Marsham) rather accused the ratepayers of being asleep—for he told them to wake up, which he supposed meant the same thing. It was not fair, however, to state that the town was spending £1000 more a year on the lighting, unless the extra benefit derived was also pointed out. When this matter was brought forward on a previous occasion, the Electrical Engineer showed the additional candle power obtained now compared with years ago; and so convincing was his statement, that all argument against it was closed for the time being. It was not wise to be constantly talking about gas *versus* electricity in Maidstone; but after Mr. Marsham's statement, he had no other alternative than to prove that the Council's case was a good one. In its electricity, the town had a capital undertaking; and he believed they would do better in the future than in the past. Dealing with the same subject, the "South Eastern Gazette" says: "The Corporation do not admit that electric lighting is more expensive than gas lighting; but it is an indisputable fact that the cost of public lighting is now £1000 more than it was before electricity was introduced. It is contended by the Electric Lighting Committee that the town has value for its money in improved lighting; but that, to say the least, is a debatable point. The general evidence that gas is preferable to electricity for street lighting becomes stronger rather than weaker as time goes on; and where the two illuminants are offered by private companies, public authorities as a rule do not now hesitate to choose gas. The policy which is being followed at Maidstone, with its municipally controlled electricity supply, may be defensible; but no conclusive evidence has yet been forthcoming to prove that it is economically sound."

Artesian Wells in the City of London.—As the result of the increased rates levied by the Metropolitan Water Board under their Charges Act, several additional artesian wells are being sunk within the area of the City of London. Referring to the matter, the "City Press" remarks that the principal point connected with the supply obtained from these sources naturally concerns the purity of the water. It is highly important, in the interests of the public health, that the water should be satisfactory in every way, and free from pollution. In this respect, the officers of the Corporation charged with the duty have been, and are, vigilant in exercising a strict scrutiny; and in every instance the supply, on being analyzed, has proved to be of good quality, and above suspicion of any kind. The Medical Officer of Health for the City states that the water to be found under the civic area is both abundant and excellent. From some of the wells the water is pumped at the rate of 6000, 7000, and 8000 gallons per hour; and, generally speaking, it is obtained at depths ranging from 400 to 550 feet.

Kippax and District Gas Company, Limited.—The second annual meeting of this Company was held at Elland last Tuesday week; Mr. Robert Porter, the Chairman, presiding. In submitting the statement of accounts for the year ended June 30, Mr. Porter pointed out that 95 per cent. of the householders were now consuming gas; the number coupled up being 795. The year's income was £1765, and the net profit £798. It was resolved to pay a dividend of 5 per cent. per annum upon all shares from the date of payment of each instalment. A cordial vote of thanks was accorded the Chairman and Directors for their services.

Accidental Poisoning by Coal Gas.—Miss Makinson, a schoolmistress of Tebay, while spending part of her holidays with her father in Bolton, met with her death under distressing circumstances last week. She was found by her father in an unconscious condition by a gas-griller in the back kitchen. A medical man was summoned, and he tried artificial respiration without avail. There was a bruise on the young lady's head, as though she had fallen over the griller. The stove was not lighted, but the gas was turned on. At the inquest, the doctor who had been called in said death was due to gas poisoning; and he expressed the opinion that Miss Makinson had fainted, and fallen over the stove after turning on the gas. The Jury found that death was due to poisoning by gas fumes accidentally inhaled.

Barnet District Gas and Water Company.—In the report which will be presented at the half-yearly meeting to-day, the Directors state that the mains necessary to give a constant supply of water to the high-level parts of Finchley have been laid and brought into use. Under the Company's Act of 1904, the Directors lately acquired land at Colney Heath, within the Company's water limits, and entered into a contract for the construction of a well so as to provide an additional source of supply to cope with the increasing demands of their district. Shortly after the work had been commenced, an action to restrain the Company from completing their well was brought in the name of the Attorney-General at the instance of the Marquis of Salisbury, who is the owner of a well from which Hatfield is supplied with water. This well is at a considerable distance from the site of the Company's intended well. The action came on for hearing last month, when the Company were represented by Sir Robert Finlay, K.C., and Mr. Balfour Browne, K.C.; but Mr. Justice Ridley, who presided at the trial, having regard to recent decisions under which other water companies have been restrained from carrying out their works, decided against the Company, and granted the injunction asked for. The terms of the Company's Act of 1904 differ from those of the other companies referred to; and, acting on the advice of Counsel, notice of appeal has been given. The hearing of the appeal, it is expected, will take place in the ensuing autumn. The balance standing to the credit of the profit and loss account amounts to £27,577, out of which the Directors recommend the declaration of a dividend, less income-tax, for the half-year ended June 30, at the rate of 7½ per cent. per annum on the "A" and "C" stocks; 6½ per cent. per annum on the "B" stock; and 5¼ per cent. per annum on the "D" capital gas and water stocks.

Coal Tar for Roofs.—A correspondent writes to the "Ironmonger" as follows: "I shall be pleased to know what has been the experience of any of your readers in respect of coal tar as a coating on roofing. Seven years ago I put up some buildings, using 22-gauge galvanized iron, and coating the surface with coal tar. I now find the metal badly damaged in places with red rust. I am anxious to do something to prevent it getting into a worse condition, if that is possible."

Manchester Corporation Employees Thrift Fund.—The Manchester Corporation old-age pension and sick benefit fund, which was established in 1893, has now a total contribution of £273,500. On last year their was a gain of £35,719. Each member pays 9d. in the pound; and the Corporation add another 3d., and pay 4 per cent. compound interest on the yearly savings. The capital, with interest, is paid out in a lump sum on a member reaching 65 years of age. There is also provision for members receiving an advance in case of sickness.

Suicide by Gas.—On returning home from his work last Wednesday, a man named Bernard Nash, of Bigland Street, Salford, failed to gain admittance by the front door. He went round to the back, climbed the yard wall, and got in. On entering the house, he found his wife lying on the floor unconscious, with one end of an india-rubber pipe in her mouth and the other end on the gas-bracket, the tap of which was turned full on. He immediately raised an alarm. The police were informed, and a doctor was sent for. Artificial respiration was tried for two hours, but without success.

Reductions in Price.—As announced elsewhere, the Bath Gas Company have reduced the price of gas to 1s. 11d. per 1000 cubic feet. As from the 30th of June, the price of gas supplied through ordinary meters by the Wrexham Gas Company has been reduced 3d. per 1000 cubic feet. The prices are now 2s. 6d. for lighting, heating, or cooking, with a discount of 3d. if paid within a month after the quarter end; and 2s. 2d. for motive power, with a discount of 2d. The Port Glasgow Town Council have reduced the price of gas to ordinary consumers by 2d. and to prepayment meter consumers by 1d. per 1000 cubic feet. The present price to ordinary consumers is 3s. 4d.

New Joint-Stock Companies.—The Etna Lighting and Heating Company, Limited, has been registered with a capital of £1000, in £1 shares, to adopt agreements with J. Warry and G. N. Arculus and with H. R. Prosser for the acquisition of certain patents, rights, tools, &c., and to carry on the business of electrical and gas fittings manufacturers, lighting and heating engineers and contractors, &c. The Patent Wood Pipe and Tube Company, Limited, has been registered with a capital of £5000, in £1 shares, to adopt an agreement with H. P. Hansen, J. Hutchinson, and T. Dodds (trading as the Hansen Syndicate) for the acquisition of a certain invention relating to the manufacture of pipes from wood shavings, and to carry on the business of makers of patent wood pipes and tubes, &c. The Thornaby-on-Tees Gas and Chemical Plant Company, Limited, was registered on the 21st inst., with a capital of £1000 in £1 shares. The first Directors are G. Pettigrew and E. S. Pettigrew.

Death from Producer-Gas Poisoning.—An inquest has been held at Bishop Auckland on the body of a labourer named Benjamin Hemsley, 64 years of age, who met his death while acting as attendant at the producer-gas plant connected with a forge at the works of Messrs. Robert Wilson and Sons. An engineman stated that he found the deceased gassed, and that witness and another man were glad to get out into the open air as the gas was so strong. The foreman blacksmith gave it as his opinion that Hemsley had found a leak, and was attempting to repair the defect without having previously stopped the working of the plant. Medical evidence was to the effect that death was due to producer-gas poisoning; and the Jury returned a verdict accordingly.

Belfast Corporation and the Sale of Gas-Fittings.—A deputation representative of the various branches of the gas-fitting trade in Belfast have attended before the Gas Committee for the purpose of explaining their ideas relative to the sale of such fittings by the Corporation direct to the public. On behalf of the deputation, Mr. Patterson said he knew that the Committee, at the time they undertook to sell gas-stoves, did so to increase the consumption of gas; and he now understood they were about to make a new departure by selling gas-fittings. Those engaged in the trade in Belfast were prepared, anxious, and willing at all times to sell the best gas-fittings. Owing to the very keen competition, the public were well served; and the Committee would not add one consumer to the numbers they already had by the sale of these fittings. Other speakers asked the Committee to reconsider the matter, and to recommend the Council to rescind the resolution which had been adopted authorizing the Committee to sell fittings. The Chairman (Mr. J. A. Doran) stated that he and every member of the Committee sympathized with the views of the deputation; but numerous complaints had been made by the public about gas-fittings. The only desire the Committee had was that the gas consumers should be supplied with good and proper fittings. The opinions expressed by the deputation would receive careful consideration.

The half-yearly conference of the representatives of the Richmond Gas Stove and Meter Company, Limited, was held at the Company's meter branch (Messrs. George Glover and Co., Limited) on Friday, the 20th inst.—Mr. H. M. Thornton presiding. They afterwards visited the Imperial International Exhibition, where they were entertained at dinner by the Company.

We learn that there has been erected at the Hitchin Gas-Works one of the "Standard" centrifugal washers of Messrs. Kirkham, Hulett, and Chandler, Limited, in accordance with the arrangement described in our "Register of Patents" columns for Aug. 10 (p. 388). It is expected that a trial of the apparatus will be made as soon as the washer has been connected up to the plant by the Gas Company.

A fine of 10s., including costs, was inflicted upon Thomas Feeney, who was summoned for wilfully breaking a street-lamp at Warrington. Defendant was seen to pick up a large stone and smash the glass of the lamp. It was stated by a Corporation official that the damage to street-lamps in Warrington was very great; the cost to the town being £150 annually for the renewal of breakages. The lamp in question had been broken five times during a period of six weeks.

We have received the season's catalogue (1909-10) of the New Inverted Incandescent Gas-Lamp Company, Limited. In its 64 large quarto pages will be found a great variety of burners, fittings, arc lamps, &c., including the "Medium" burner, which comes, in point of size, between the bijou and the large burner. Special attention is directed to this, the latest, pattern as being specially suited for domestic lighting; lending itself admirably to decorative effect, and at the same time attaining a very high efficiency. The catalogue contains some unique designs in fittings and glassware. All the Company's burners have been substantially reduced in price, and with them regulators are now supplied without extra charge.

In "Electricity Supply Memoranda" in the last number of the "Journal," reference was made to some terrible panics caused round about Portsmouth through the fusing of electric wires in places of public resort. The Watch Committee of the Corporation are evidently impressed with the necessity of having gas as a stand-by in the event of a failure of the electric light; for at a meeting held last Tuesday to hear applications from local managers for licences for the performance of stage plays, the Chairman announced that the licences of the Theatre Royal, the King's Theatre, and the Prince's Theatre would be granted, subject to alterations in respect to the provision of gaslights in certain passages. The licence for the South Parade Pier was also granted on condition that gaslights should be installed.

"A Century-and-a-Half of Commercial Enterprise" is the title of an interesting booklet issued by the Carron Company in connection with their 150th anniversary. Founded in 1759, the Company was practically the pioneer of the iron industry in Scotland; and it has played an important part in the history of commercial enterprise. The unbroken business career of the Company is traced, and references are made to the numerous distinguished personages (including His Majesty the King, when Prince of Wales) who have visited the works, the development of which is well illustrated. The foundry work, as our readers may remember, embraces cooking apparatus for coal, gas, steam, and electricity. The account closes with a few remarks on the Company's shipping business, which was in operation long before steam-propelled vessels were invented. The booklet is neatly printed and has an artistic wrapper.

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Ottoman Gas Company. London Offices, Sept. 7, One o'clock.

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Coke.
Ramsgate Corporation. Tenders by Sept. 13.

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Applications should be made on Form T. 17, to be obtained from the Education Officer, London County Council Education Offices, Victoria Embankment, W.C., to whom they must be returned not later than Eleven a.m. on the 11th of September, 1909, accompanied by *copies* of Three Testimonials of recent date.
All communications on the subject must be endorsed "T. 1.," and a stamped addressed foolscap envelope must be enclosed.
Canvassing, either directly or indirectly, will be held to be a disqualification for employment.

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Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager.

Sealed and endorsed Tenders to be sent to me not later than Tuesday, Sept. 14, 1909.

By order,
GEO. G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
Aug. 18, 1909.

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The Directors do not bind themselves to accept the lowest or any Tender.

R. O. PATERSON,
Engineer and Manager.

Gas-Works, Cheltenham,
Aug. 25, 1909.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

THE Committee invite Tenders for the Purchase of the whole of their Surplus COKE (estimated at from 1500 to 2500 Tons), or for Quantities of not less than 200 Tons per Annum, from the 1st of October, 1909, to the 30th of September, 1910, delivered free on Rail or Barge, Ramsgate, or free into Carts at the Gas-Works, Ramsgate. Purchaser in any case to pay dues.

Further Particulars, together with Conditions and Form of Tender, may be obtained from the undersigned.

Tenders to be sent in not later than Noon on Monday, Sept. 13, 1909. addressed to the Chairman of the Gas and Water Committee, Boundary Road, Ramsgate, endorsed "Tender for Coke."

The Committee do not bind themselves to accept the highest or any Tender.

WM. THOMSON,
Engineer and Manager.

Gas and Water Offices,
Boundary Road, Ramsgate,
August, 1909.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at 9, Queen Street Place, Cannon Street, E.C., on Tuesday, Sept. 7, 1909, at One o'clock precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last; to declare a Dividend; and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from Aug. 31 to Sept. 7, both days inclusive.

By order of the Board,
THOMAS GUYATT,
Secretary.

9, Queen Street Place,
Cannon Street, London, E.C.,
Aug. 24, 1909.

SUPPLIER of Gas Controller Patent No. 20,109/07, working through pressure, should apply in first instance to "C.C.100," care of NEYROUD & SONS, Advertising Offices, 14-18, Queen Victoria Street, LONDON, E C.

THE Proprietor of the Patent No. 11,145 of 1901, for "IMPROVEMENTS IN GAS-RETORT CHARGING APPARATUS" is desirous of entering into Arrangements by way of LICENSE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.

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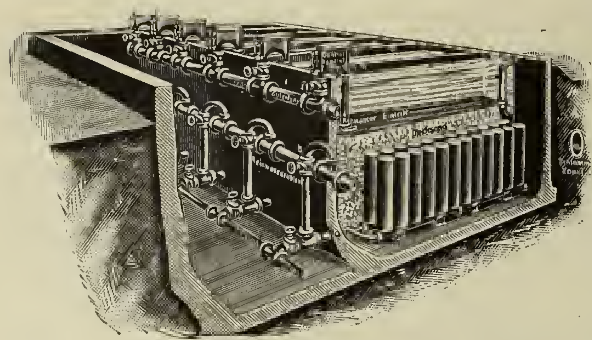

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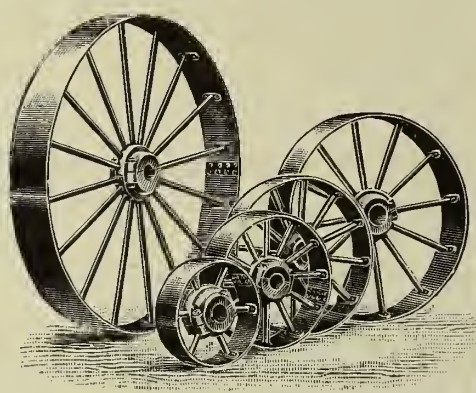

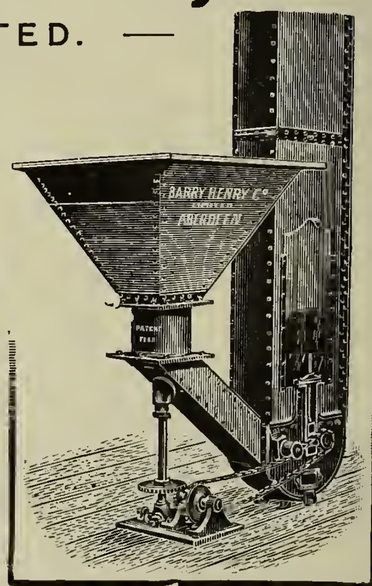

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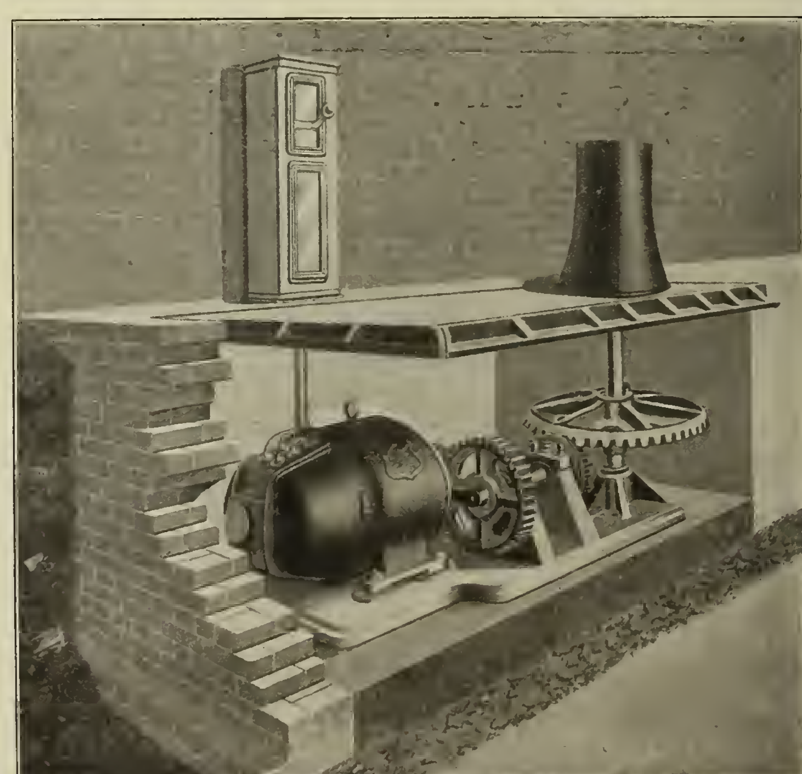

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Inverted Arc Lamp, Fig. 623.

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Height over all.

1-light . . .	1 ft. 8 ins.
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4-light . . .	2 ft. 7 ins.

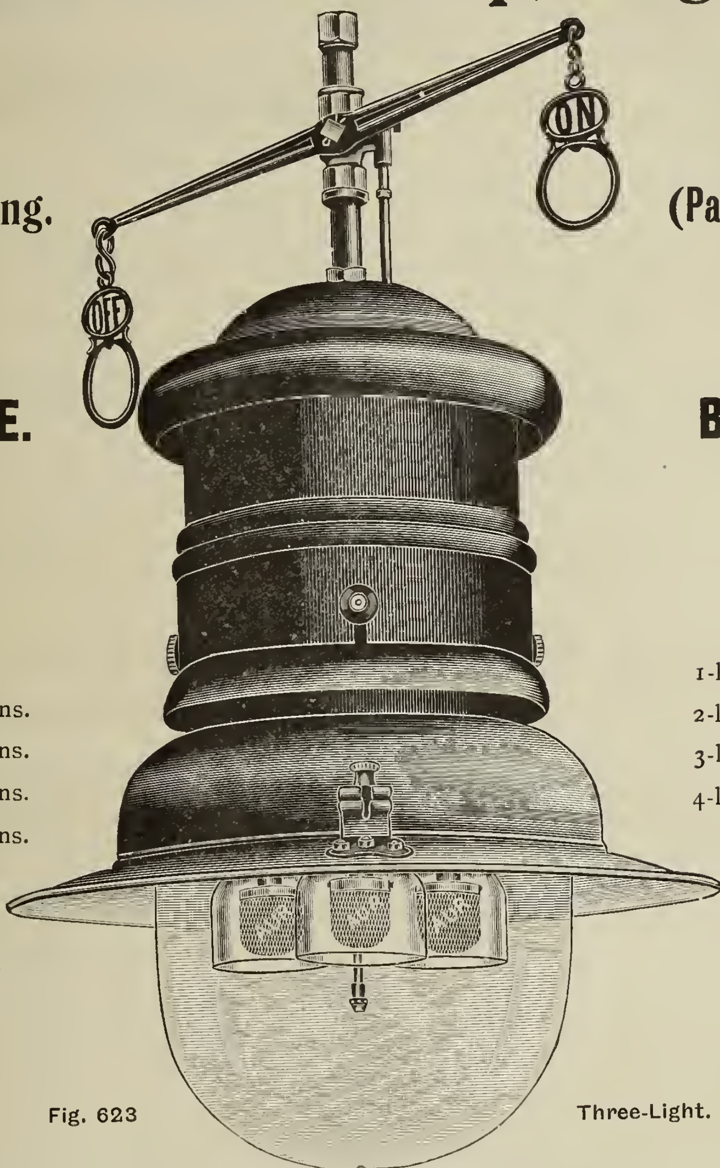

Fig. 623 Three-Light.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

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1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
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THE JOURNAL OF GAS LIGHTING WATER SUPPLY & SANITARY IMPROVEMENT

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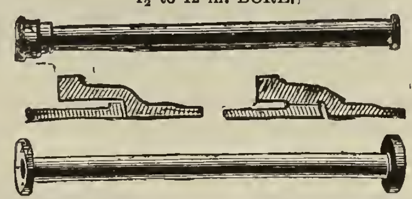

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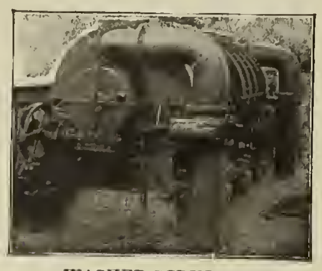

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CONTENTS.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVII., No. 2417.——TUESDAY, SEPTEMBER 7, 1909.

EDITORIAL NOTES—GAS, &c.

Points from the Session's Work.

N resuming the review of the work of the Parliamentary ession as affecting gas supply, it may be stated that the umber of private measures introduced (omitting Provisional)rders) in which gas was, entirely or partly, concerned was 9, and 22 have succeeded, with more or less amendment, hich will be dealt with when the prints of the Acts are ll available. The seven Bills that have fallen are easily ccounted for; and in most cases they suffered extinction at uite an early stage of their career. The Bradford, Fermoy, nd Sheringham Bills, proposed the purchase of gas underikings; but in the Bradford and Sheringham cases, it was ot Parliament but the ratepayers who put an effectual end) the schemes soon after birth. The Bradford Bill proosed the purchase of the Pudsey and the Drighlington and ildersome Gas Companies; the Fermoy, the local underiking; the Sheringham, both the gas and water concerns. 'he Bill proposing incorporation for the Biddulph, Bradley ireen, and Black Bull Gas Company was dropped almost s soon as lodged; the Lisburn Gas Company's Bill was ithdrawn (on an agreement for purchase) in favour of the ne promoted by the District Council for the compulsory cquisition of the Company's property; the Salford Corporaon Bill was withdrawn under the circumstances narrated ist week; the Amman Valley Gas Bill—around which hangs tale of sordid promoting craft and cupidity—also went nder on an agreement with the promoters of the Ammanord Bill for the transfer, on arbitration terms, of the works iat were inoperative for want of powers. It was the only ay out of an uncomfortably tight position for the promoters f the Amman Valley Company. Of the Gas Bills that suceeded, there were few that were opposed; and those that ad to meet a contest in the second House can be counted pon the fingers of one hand. Most of those that avoided ctual opposition had petitions lodged against them in the eginning of their parliamentary course; but settlements ere effected in the majority of cases, though not in all did ley succeed in escaping unscathed from examination by ie Unopposed Bills Committee, who in several cases made ianges, either on their own initiative or through the repreentations of Government Departments.

While the authorities have exhibited a change of front in spect of the matters referred to in the article last week, i other directions in which change is desired they are inexible; and in certain ways there is not consistent practice n their part. In the matter of the supply of power gas y Companies, the Unopposed Bills Committee in two cases ave refused clauses proposing to authorize such supply. he Leyland and Faringdon Gas Company desired to be npowered to supply "Mond" gas; but the Committee ated that they were not in favour of granting powers for mething for which there may not be a demand. In the ise of the Heckmondwike and Liversedge Bill, power gas auses were also refused by the Select Committee; and the romoters were told to wait until the matter had become ne of "practical politics." If gas undertakings wait for ie maturing of this condition before seeking the power to ipply, they may be the losers of the business; for manuicturers cannot delay fitting up their factories with power hile a gas company or a gas committee go through the rocess of making application to Parliament to obtain inction to supply the industrial needs, and have then to y down the producing and distributing plant. But here e have one of the several anomalies in parliamentary proedure, which is that, if sanction to supply power gas is reiired by a gas undertaking, it is better that the Bill should e opposed, and go before a Select Committee in the House of Commons rather than before the Unopposed Bills Committee. Several gas companies have secured the right to supply power gas in past sessions; and the Aldershot Company have done so in the present one, subject always to the conditions applying to power gas supply, and any regulations hereafter made by the Home Office. The Harrogate Company, too, have, under these conditions, been authorized this session to undertake the provision of suction-gas plant where required. This inconsistency of the parliamentary authorities is undesirable. Gas undertakings are becoming more and more the centres for the supply of gas for all purposes; and it is better in the public interest that the business should be concentrated in their hands as much as possible. To that end Parliament should render aid. However, notwithstanding the expansion of the business of gas undertakings, Mr. Emmott, the Chairman of the Unopposed Bills Committee, and his colleagues entertain doubts as to the future of the gas industry. They are peculiar in this. But the fact remains that, in dealing with the Swinton and Mexborough Gas Board Bill, the Chairman stated that "the mind of the "Committee is set against any increase, and, in fact, is rather "set on a decrease, in the number of years they are likely "to allow for the purchase of gas-works, because of the "somewhat doubtful character of the undertaking in future." We are inclined to think that it will be better for the Committee to continue to entertain this view; for what with the limitation of profit appropriation and a decrease in the number of years allowed for the repayment of the purchase money, gas undertakings will assume less eligible proportions of favour in the eyes of local authorities as subjects for expropriation.

There is rigorous adhesion on the part of the authorities to the 14-candle gas standard for illuminating power, as now inserted in the model clause. All the Gas Acts, save one, this year dealing with the question will contain the 14-candle standard. Local authorities, as well as gas companies, are unanimous in applying to Parliament in these days for a reduction to the 14-candle level, with the "Metropolitan" No. 2 argand as the test-burner. It is a pity local authorities who come to Westminster to oppose the reduction of illuminating power and the new test-burner do not appreciate how futile and quixotic is their procedure, and that it means certain defeat for them. More than once during the present session, Chairmen of Committees have put an end to the waste of public time in this matter; and it is hoped that the session will have witnessed the end of so useless and senseless a proceeding on the part of ill-advised local authorities. Through the passing of the Gaslight Company's Act, London will, as from Jan. 1 next, be entirely under gas supply with a 14-candle standard; and in not a single instance has there been refusal of an application for the 14-candle standard, accompanied by the No. 2 burner. The only Act in which a lower standard—12 candles—is mentioned is that of the Bury Corporation; and, in this instance, it was allowed in view of the fact that the Corporation had previous full liberty in the matter of illuminating power.

The session has, in two respects, been made epochal by the Act of the Gaslight and Coke Company—first, there is the advent in it of a calorific power clause, and, secondly, it marks a territorial change in Metropolitan Gas Supply. From both possibly greater things will ensue. A calorific power standard is a certainty of the future. This introduction will most probably hasten it; but it must be vigorously resisted until the illuminating power standard has been completely annulled. The Gaslight and Coke Company merely assented to the dual penalty test with the greatest reluctance, and solely as being expedient to the safety of their special plans. It is an agreed introduction; and Parliament, though pressed (in view of it) to insert a calorific standard in the Coatbridge Gas Order at the instance of the

Corporation, declined in both Houses. It is to be hoped that Parliament will never commit the injustice of inflicting upon gas suppliers two concurrent standards for quality. There are some gas men who are hoping for complete emancipation from qualitative episcopy; but we are afraid that they are allowing their hopes to fly too high. Under the granting of statutory privileges, it will only be by the substitution of some fresh standard that the worthless illuminating power standard will be allowed to become extinct by Parliament. Not in respect of gas qualitative powers, but in connection with the annexation by agreement of the West Ham Gas Company's district, powers, and property, the Gaslight Bill was opposed in both Houses by the West Ham Corporation only; and week after week in the House of Commons the Bill was blocked by Mr. Thorne on their behalf. The economic advantages of the amalgamation scheme, however, were proved up to the hilt in both Houses of Parliament. The greatest concession the West Ham Corporation secured—and this owing to the desire of the promoting Company to work on a friendly footing—was the agreement that the West Ham works should be continued for a decade on substantially the same scale as prior to the promotion of the Bill, although the insatiable West Ham Council wanted twenty years, with the agreement extended to labour being continued over that period on a like scale. With the great changes in the occupation of labour in the gas industry—the industry gives employment to more labour now than ever before in its history—the condition could not be conceded, nor would Parliament compel such an unreasonable stipulation, nor the one as to the twenty years. It is possible that this amalgamation is but the forerunner of other changes of a like nature in connection with the Metropolitan Gas Supply.

The Alliance and Dublin Consumers' Gas Bill was very keenly contested, and ended (by agreement and not by compulsion) in some facial changes in the measure of extreme financial importance to the Company. They cannot all be detailed here. The standard price was reduced to 3s. 7d.; but there was an agreed unprecedented condition that for three years the price of gas is to be regulated by the cost of coal. The charge of 3s. 4d. for gas is not to be exceeded so long as the average price of coal is 13s. 6d. per ton c.i.f. For every 1s. the price of coal rises above 13s. 6d., an extra 1d. per 1000 cubic feet may be charged; while for every 1s. the average price of coal falls below 13s. 6d., the charge for gas is to recede by 1d. There are obvious objections to the arrangement in the circumstances of the Dublin Company; but, on the whole, there is no doubt the Act will eventually prove of great benefit to them.

Several gas undertakings have secured extensions of areas; and, in two or three instances, projects for the purchase by gas companies of small undertakings in the extended areas have been ratified. The session has also supplied its illustrations of the folly of neglecting opportunities in respect of both the exercise of powers and the confirmation by Parliament of supply operations in excess of statutory authorization. Four Purchase Bills have succeeded this year—the Lisburn, by agreement; the Swinton and Mexborough, under a purchase clause inserted in the Company's Act last session; the Risca; and the Prestatyn, by which a privately owned concern is to be acquired. In the Heckmondwike and Liversedge Gas Company's Act, a suspensory clause has been inserted on the lines of the Merthyr Tydfil Act of 1906. In that session also a similar clause was embodied in the East Hull Act. The ratepayers of Merthyr refused to endorse purchase by their Council; the Hull Corporation were defeated when they came to Parliament with a Purchase Bill in 1907; and the District Council who obtained the insertion of the suspensory clause in the Heckmondwike Act this session have not a brilliant record to present to Parliament to show their qualification for the management of the local gas concern. On the whole the Heckmondwike Company have not much to fear. The electricity powers obtained by the Aldershot and the Yorktown and Blackwater Companies should be noted, as being the most extensive electricity supply authorization yet granted to gas companies. Only one other point is of sufficient importance for special reference; and it is that the session has seen the supersession of the Police and Sanitary Regulations Committee by the Local Legislation Committee, with extended powers, and directions for unifying, as far as circumstances allow, the legislative projects for local government that come before them. In view of this direction, the limitation of profits in the case of Oldham (as mentioned last week) is significant.

Considerations Affecting Rates of Increase.

The half-yearly statements of all the London and Suburba Gas Companies have now been issued, and meetings of th proprietors held. It will have been observed, from th reports and the Chairmen's speeches, that the variatio in business expansion have been somewhat striking. Th rates of increase, represented as percentages, have not bee in several instances, of the order that were witnessed at or time of day. It cannot be admitted that the weather of th half year had much to do with this. Depression of trad and consequent unemployment, had; so had the continue increasing use of the lower consumption inverted inca descent burners. The competition of electricity cannot b credited with having made any substantial additional im pression upon the gas business; inasmuch as, on all hand the general complaint of electrical managers is that the lighting business has diminished, that the records show bu comparatively few extra lighting consumers enrolled, an that additional business is mostly in the power line, throug displacement of steam-engines, or else the starting of ne factories. Last year being leap year, the past six mont suffered in comparison the loss of a day; and a day's co sumption in February is of considerable consequence. I addition would have made many a figure representing, fo London and the suburbs, the percentage of consumption i crease go up one figure on the left-hand side of the decim point, and would have turned a fractional decrease in th case of the South Metropolitan Gas Company into an i crease of some 0·39 per cent. The other Companies in an about London reported these percentage increases in co sumption: Brentford, 3·2; Commercial, 2·3; Croydon, 2·5 Gaslight and Coke Company, 0·7; South Suburban, 2·5 Tottenham, 8·3; Wandsworth 3·2; West Ham, 5·5.

These variations in increases in consumption, it is paten are not so much due to the prices charged as to the cond tions existing in the locality. Reductions no doubt stim late consumption; but, advocates as we are of the lowe possible price, we are compelled to realize that lowness o price alone is not sufficient to maintain for any concern uniform rate of increase in consumption. For instance, th Wandsworth Company are now supplying at 1s. 11d. pe 1000 cubic feet; and their increase was 3·2 per cent. la half year. Brentford, with a 2s. 9d. price, also had a 3·2 pe cent. increase. But the Wandsworth 3·2 per cent. increas did not represent such a large volume of gas as in the cas of the Brentford Company, seeing that the respective sale of the Companies were 544,581,000 and 1,342,560,000 cubi feet. Then, again, take Croydon with its 2s. 8d. price, an its increase of 2·5 per cent. The West Ham Gas Compan charging the same price, had an increase of 5·5 per cen And the Croydon increase was only on a consumption o 620,753,000 cubic feet, as compared with 915,419,000 cubi feet in the case of the West Ham Company. Then ther was the South Metropolitan Company, charging only 2s. 3d but showing a fractional decrease in consumption; while th Tottenham Company, charging 2d. more, had an increas in consumption of 8·3 per cent. But the total sales of th Companies were, respectively, 6,286,736,000 cubic feet an 725,018,000 cubic feet. In comparing certain of the per centage figures, regard must, of course, be had to the volum of gas they represent. A uniform volume of increase ma continue year after year; but there will be a gradual de cline in the percentage figures the volume represents.

However, the figures quoted are the proof that to pric cannot be assigned the discrepant experiences in increase of business. Local circumstances—particularly local deve lopment or stagnation in building—have, it is clear, a large influence. Districts seem to go through—independent o any general trade conditions—a (so to speak) cycle of pro sperity and depression peculiar to themselves. New estate are opened up, or old houses are replaced by new; and th popularity of these new and modern equipped houses ro the districts containing the older order of property of a par of their tenants. But the time comes when what was onc new and magnetic loses those virtues; and a change agai sets in. At present London and the inner suburbs hav an extraordinarily large number of empty houses; and th fact is interesting in considering the latest returns as to th rates of increase in gas consumption. According to som statistics that Mr. John Burns, in reply to an inquiry, pre sented recently in the House of Commons, it is found that in 26 of the Metropolitan boroughs (no information wa available for Wandsworth and Southwark), there are no les

than 45,500 empty houses and tenements. There is much speculation as to the cause of this. One authority puts it down to the want of employment, and to the removal of some large industrial establishments from London. A prominent example is the removal of the London and South-Western Railway works from Nine Elms to Eastleigh, which, it is calculated, has taken from 2000 to 3000 families from Battersea and Wandsworth. Cheapness of transit is also responsible for some migration to the more distant outskirts; and to over-building is due a part of the empty property. This is an interesting matter for examination, deduction, and conjecture. But unlet property diminishes the scope of the gas business; and as most tenantless houses have gas-services running into them, there is represented a substantial amount of unproductive capital. What is one concern's loss in revenue, is always another concern's gain. In that, however, there is poor consolation for the concern whose new business is shown at a diminished rate by this and the other causes. To the revival of local industrial activity, we must look for a better state of things. Our local authorities seem to find it hard to learn the simple lesson that it is by the encouragement, and not by the repelling, of industry that localities maintain the highest level of prosperity. For the well-being of a district, it is more important to keep industry within its limits, than lavishly expend money on certain less productive (but rate-increasing) objects that will occur to most readers with knowledge of the affairs of local government.

Breakdowns of Gas and Electrical Machinery.

The axiomatic saying that as much is learned from failures as from successes is particularly applicable to machinery; but we fear the lessons of failures are not taken to heart so completely as is desirable in the interests of owners. If they were, the annual report of Mr. Michael Longridge on engines, boilers, and electrical plant would not year after year record so many accidents of previously experienced character that are traceable to faulty design, negligence, and indolence. But their recounting is educationally beneficial. Men as well as machines change; and the causes of trouble with the latter are, naturally, not so well known to the younger men as to those to whose places they have succeeded. Their nescience in this particular is due to inexperience, and not necessarily to personal apathy. Furthermore, though it is quite impossible to make anything mechanical so perfect that it can be categorically asserted to be proof against mishap, the statement of the ascertained grounds of failures all help, or should help, to improvement in design, protection, and certainty. No small part of the advances towards mechanical perfection are due to the failures of a past day. For these and other reasons that will readily occur to mind, the hope may be expressed that Mr. Longridge will not, in his future annual reports, curtail the practical experiences of the year in respect of internal combustion engines to the narrow limits that he has done in the one reviewed elsewhere this week.

Taking steam and gas engines and electrical motors on direct current, it is interesting to notice the correspondence in the report of the ratios of breakdowns. In steam-engines, the failures were equal to 1 in 9·4; in gas-engines, 1 in 9·1; in direct current electric motors 1 in 9·2. In motors on alternating current, the ratio was 1 in 11·3. In starters and controllers, the ratio was 1 in 24. In regard to dynamos, the failures with direct current were 1 in 13·7; but, with alternating current, there is a bad return—1 in 5·7. The figures given in the tables should serve as a guide to the parts to which it is essential manufacturers should direct more attention with a view to improvement, and so helping to avert the troubles to which the users of their engines or motors are exposed. For example, in connection with gas-engines, there is continued evidence of weakness in the design and manufacture of valves and valve gear; the percentage of failures in these respects being very large. It is also amazing that there should be such an amount of inexcusable neglect on the part of users as to produce the high percentage quoted of preventible accidents. In illustration, observe the considerable increase in the percentage of cracked cylinders and cylinder ends, which are mainly due to jackets being left undrained and exposed during frosty weather. If there were less carelessness, there would be fewer accidents.

Though electric motors are of comparatively recent introduction into industrial operation, they are showing signs of rapid deterioration and extending unreliability. The breakdowns reported are annually increasing, as is also the cost of repairing the damage occasioned. Mr. Longridge describes the increase in the cost of repairing electrical plant as being "great;" but, looking on the bright side of the matter, he suggests that probably this is temporary rather than chronic, owing to expensive failures of a few large generators. In the statistics for the electrical plant (it is only fair to point out), the common experience of dirt and neglect is found; but the percentage of breakdowns through age and deterioration figure somewhat high. And—this is not unusual with electrical plant and other occurrences in which electricity plays a part—the percentage of unascertained causes of failure is remarkably high. But notwithstanding the testimony of practical experience, and the fact that Mr. Longridge takes no account of failures caused by the stoppages of the energy, our electrical friends will, it may be expected, continue to circulate among manufacturers legendary statements as to the superior reliability of electrical motors compared with internal combustion engines.

Future Development of the Gas-Engine.

The paper prepared by Mr. Dugald Clerk on the work of the British Association Committee on Gaseous Explosions, shows distinctly two things—that the Committee (whose elaborate report will be published in succeeding issues of the "Journal") have not yet made any great headway with their work; but, on the other hand, they have arrived at clear conclusions as to the lines that their work must pursue. The tangle into which gas-engine research had fallen (before the Committee took up the matter) through individual investigation following the bent of individual thought and fancy was made abundantly clear at former meetings of the British Association; and it was then seen that nothing but systematic inquiry by the union of the wisdom of recognized experts would clear away the discordant findings and errors of the individual, though admittedly earnest and enthusiastic, workers. The eminent members of the Committee, and their no less eminent associates, are now at work on the numerous problems that it is requisite to solve for the advance of essential knowledge, and consequently for the pronounced definition of the lines upon which to proceed in order to derive increased working efficiency. That they have not got far into their work is due to the expanse and intricacy of the inquiry involved; but it is to be hoped that another twelve months will see at all events more definite fruit from their labours, as indicated by Mr. Clerk. The Committee are directing their investigations to the physical and chemical properties of gaseous explosions and the combustion products resulting therefrom; for with all the inquiry there has been by physicists, engineers, and chemists, there has been failure to obtain complete knowledge of these fundamental essentials to further progress in the working efficiency of the internal combustion engine. It appears plain, from Mr. Clerk's review of the position, that we must not expect any substantial increase in indicated thermal efficiency under existing circumstances. The possibility of increase will depend mainly upon considerable alterations in the actual thermal cycle used; any substantial additional development being unlikely on the old lines of increasing compression. Nevertheless, the efficiencies attained at present are good; the table given in the paper showing that between 1882 and 1908 the indicated thermal efficiency increased from 16 to 36·8 per cent. When the Committee present us with a report on the results of their investigations into temperatures, specific heats, heat flow, and other matters, then the mechanical problems of the gas-engine can be attacked in the light of that knowledge. Looking at the weight and bulk of large gas-engines in proportion to the power developed by them, there is no doubt that they do require more attention on the mechanical than on the thermodynamic side.

Income-Tax Allowance in Respect of Depreciation.

Reverting to the editorial article in last week's "Journal" on the above subject, it may be well to point out to all gas companies the importance of keeping a watchful eye at the present time on their communications with the Surveyors of Taxes of the Board of Inland Revenue. Mr. W. A. Schultz has taken up this matter, and is in communication with some of the principal gas companies, and also with the Gas Companies' Protection Association, with a view to promoting concerted action. In the meantime, memoranda are being sent out by Surveyors of Taxes, of which we have a copy before us, to the following effect: " Sir,—A scheme

has been drawn up by the Board of Inland Revenue as to depreciation and renewal allowances, a copy of which I send you. From it you will see that depreciation is not to be allowed. Kindly inform me on opposite page if you accept the scheme for 1909-10." It is clear from this that Surveyors throughout the country are being instructed to obtain the consent of gas companies individually to this so-called scheme; and we strongly advise any who receive similar communications to the one just quoted, to either give a negative reply, or altogether withhold an answer and in the meantime communicate with Mr. Schultz, at No. 50, Cannon Street, E.C., or with the Secretary of the Gas Companies' Protection Association (Mr. F. E. Cooper, No. 5, Victoria Street, Westminster). We are glad to see, from the letter by Mr. H. E. Jones in our "Correspondence" columns, that this central watching organization is thus promptly moving in the matter, as it is not a question that can be left indefinitely in abeyance; and the sooner the Inland Revenue authorities learn that gas undertakings are prepared to unite in resisting their ruling (as explained last week, pp. 556, 585) in this regard the better.

Salford and the Gas Profits.

It is hoped the out-districts of Salford will treat the resolution passed by the Salford Corporation last Wednesday with the contempt that it deserves; for, in its tail-part, a more puerile and injudicious resolution could not have been passed by a municipal body of the position of that at Salford. The Corporation are still smarting under the decision of the House of Lords Committee as to the limitation of the profits appropriated from the gas undertaking in aid of the rates, and the enforced withdrawal of their Bill to prevent this decision becoming irrevocable and operative. It would have been an excellent thing for the repute of municipal trading, and for the gas consumers, as well as an earnest of the Corporation's desire, in the finance of local government, that there should be equality in the matter of taxation, if the Council had accepted the decision, and run the undertaking as it should be run by a local body—for the purpose of giving the cheapest possible service. The outside districts, in their opposition to the Bill, were those who convinced the Lords Committee that unlimited profits were antagonistic to the best interests of the consumers, and that the application of unlimited profits to the purposes of the borough inflicted injustice on the gas consumers generally and the out-districts in particular. The scrapping of the Bill necessitated the out-districts doing something to realize the fruit of their victory; and their proposal to promote next session a Bill to give effect to the decision of Lord Donoughmore's Committee, has brought an answer from the Corporation in the adoption last Wednesday of the absurd resolution, authorizing the Gas Committee to enter into negotiations with the out-districts with regard to the supply of gas, and, in the event of a reasonable understanding not being attainable, the Committee are to intimate that the Council will seek relief from the obligation to supply those districts with gas. The only terms on which these districts should come to an undertanding are those indicated in the Lords' decision, supported as it is by the one in regard to Oldham. Of this the out-districts and the Salford Corporation may be sure, that the final words of last Wednesday's resolution will be, if there is a contest in Parliament next session, to the disadvantage of the Corporation. We repeat that the open threat is both puerile and injudicious; and the Council have been very ill-advised by their Committee.

Steel Mains for Gas Undertakings.

Those who read through the account appearing to-day of the opening of a gas-works at Stanford-le-Hope (which is situated in an Essex agricultural district towards the mouth of the Thames) will see that, though the undertaking is, at the present stage, only a very small one, everything about it is nevertheless quite up to date—in one respect, notably so. The retorts are fired on the regenerative principle; the gasholder is a spiral-guided one; and the street-lamps start their career with gas as an illuminant on the incandescent system. But the most noteworthy feature about the Company—who have had the benefit of the advice, in the capacity of Consulting Engineers, of Messrs. Corbet Woodall and Son—is the fact that all the mains on the district, of which about 5 miles have so far been laid, are Mannesmann steel tubes. In size, they range from 6-inch to 2-inch; and the joints are of the "rigid" type, caulked with lead wool. Steel tubes have also bee used for the service-pipes, all of which, whether to houses o lamps, are connected by the Woodall-Parkinson expansion-nipple There are also, as has been pointed out in a previous issue, othe considerations than the design and construction of the work which should be sources of satisfaction to the inhabitants in connection with their gas undertaking.

Interesting Results from Zurich.

The report of the Zurich gas undertaking for last year, o which a summary is given in another column, is especially interesting, in that it displays the advantages which have been found to accrue from the introduction of vertical retorts. During the year, approximately half the coal carbonized was dealt with in inclined retorts, and the remaining half in the new setting of verticals. Steam was introduced into the latter. The result has been that the make of gas per ton of coal carbonized works out at 2336 cubic feet more for the vertical retorts than for the inclines. The verticals also show a slightly increased yield of ammonia; but, on the other hand, they have caused a considerable reduction in the amount of prussian blue obtained from the cyanogen washers. The report also discloses some suggestive figures in regard to the make of gas per man employed in the retort-house. A few instructive remarks are also made as to the manner in which the heats of the vertical retort settings are controlled at these works. For the rest, the report displays the satisfactory growth in the consumption of gas which for some years past has been a conspicuous feature of the working of the Zurich gas undertaking. The net profit for the year is, as usual, very satisfactory, and reflects great credit on the ability with which the works are administered under Herr A. Weiss, the Engineer and Manager.

The Sequel to Certain Promotions.

Is it not time that the authorities whose duty it is, in the protection of the public, to interest themselves in the matter o doubtful promotions of commercial undertakings bestirred themselves to make inquiry into the promotions of gas and water concerns in respect of which receivers and managers have recently been appointed, in order to see whether or not there is anything about them that calls for action on their part? Modest paragraphs that have recently appeared in our columns announce the appointment by the High Court of receivers and managers in connection with the East Sussex, the Laindon, the Robertsbridge, and the Rawcliffe Companies; and not long since the Amman Valley wreck was prominently in evidence. This run of motions for the appointment of receivers and managers points to the questionable genuineness of the flotations in the first instance, having regard to the capitals raised and to the part of the proceeds allocated by the promoters to themselves. The public authorities whom we have in mind would find the specious prospectuses that were issued in connection with the above-named concerns of peculiar interest at the present time. They might also with advantage study the preambles of the Amman Valley and Ammanford Bills in the present session of Parliament, as well as the comments that have from time to time appeared in the "Journal" on the affairs of the other Companies in connection with which receivers and managers have been appointed.

The Effects of a Coal Strike.

A little late in the day, perhaps, but welcome for all that is the remark that may be applied to an article on the late coa crisis which has recently been written by Mr. John Wilson, M.P. What he has to say would undoubtedly have been more useful at the time when the miners were balloting upon the question of whether or not, in certain circumstances, there should be a "national strike;" for there is good reason to believe that the consequences that would have attended such a struggle were not sufficiently before many of their minds when they cast their ballot for a strike. These consequences, as he points out, would have been general stagnation through every part of our commercial life, and inconvenience in the home, and that in millions of them there would have been poverty and no means of relief. Mr. Wilson is of opinion that there can hardly have been a man, on the workers' side at least, who did not feel as if a great weight had been removed from him when, by the action of the President of the Board of Trade, the difference in the Scottish coalfield was

settled; and he states that he has never known a workman to show anything but gladness at the passing away of the calamity. This really does not seem so much to bear out the idea that the ballot was cast without consideration, as to prove that many men must have voted against their own convictions. If, however, it is correct, there is some consolation in the statement; for future proposals in the direction of "national strikes" should fall decidedly flat among that class who would undoubtedly be the greatest sufferers from such an event—namely, the employees. A strike of this kind, as Mr. Wilson says, could not in any event have been of benefit to any party or person, and would have been calamitous to the trade of a great industrial nation like ours. In explanation of his silence just at the time when outspoken opinions would have been of the greatest value, Mr. Wilson states that when it was decided by the Miners' Federation conference to take the ballot, it was likewise determined that no one should give advice to the members, but that they should be left without guidance. It was grievous to him to remain silent in an important crisis like this; but he resolved to abide by the decision, even while he felt it was not the position for leaders of men to take. It certainly seems to us that it was not. The men look to their leaders to lead; and this expectation should be satisfied on all occasions, and not merely on some, as appears to be the case. Altogether, the miners' ballot can be likened to a general election without any speeches or addresses. In such an event, many voters would feel considerable difficulty in coming to a wise decision.

Marriage of Mr. L. J. Langford.—At the Parish Church, Longton, last Wednesday, the marriage was solemnized of Mr. Leonard James Langford, third son of Mr. William Langford, the Corporation Gas and Electrical Engineer, and Miss Beatrice Webberley, fourth daughter of the late Mr. John Webberley. There was a large gathering. After the ceremony, the wedding party assembled at a *déjeuner* at the residence of the bride; and later in the day Mr. and Mrs. Langford left for Ilfracombe. The bride and bridegroom received a handsome collection of presents; the father of the latter giving a cheque and a silver tea and coffee service. Mr. Leonard Langford was formerly with his father at Longton, but is now Manager of the Abertillery Gas-Works.

Internal Protective Coating for Water-Pipes.—Experimental researches carried out by M. Ferrier, a chemist of Vitré (Ille et Vilaine), have led him to the conclusion that only slightly mineralized water, like that of the Brittany region, attacks lead or iron pipes. In the first case, the water carries along with it very noxious lead products; and in the second, insoluble iron compounds are formed which clog the pipes and absorb the dissolved oxygen. Internal application of coal tar protects cast iron for a time, but not wrought iron, which is used for the small branches. Pipes lined with enamel, glass, or tin are both expensive and fragile, moreover they are not practicable. The remedy proposed by M. Ferrier is the artificial mineralization, by the addition of lime, of all water containing less than 7 centigrammes of lime per litre. The pipes then become coated, and are thus protected. The quality of the water is improved by the partial precipitation of germs and organic matter; also by enrichment in lime, on which its potable value depends.

Treatment of Volatile Products of Tar.—A process for the continuous extraction, purification, and rectification of the volatile products of tar is the subject of a French patent taken out by M. Barbet, whose specification is abstracted in the current number of the "Journal of the Society of Chemical Industry." The crude tar is fed from an overhead store-tank into a tubular heater, where it serves to cool the naphtha vapours and then passes down a column into a boiler, where it is heated by high-pressure steam. The vapours pass into a rectifying column, from which at different points very pure benzol, toluol, and xylol are separately withdrawn, condensed, and cooled. The tar passes from the first boiler into a second similar one, also steam-heated, where the heavier naphthas are driven off, and are condensed in the tubular heater mentioned above. The tar then passes through a series of stills, provided with agitators, set in brickwork. The last still of the series is heated by direct fire; the waste gases serving to heat the other stills. Carbolic oil, creosote, and heavy oil are driven off, cooled in air condensers, and collected; and soft pitch flows away continuously from the last still. The heavy oil may, if desired, be passed through a "cracking" still heated in a lead bath in order to dissociate it into lighter products. The carbolic oil is passed continuously through a series of conical vessels packed with materials presenting a large surface, and a stream of caustic soda solution is sent through the series in the opposite direction. Washed creosote issues from one end of the series, and, after treatment with sulphuric acid, is fractionated in a continuous column still. The sodium phenate which issues from the other end of the series of washers goes through a decomposer, where it is treated with acid or acid sodium sulphate, and the separated crude tar acids flow away into a store tank. They are then passed down a continuous column still and fractionated.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 649.)

Business on the Stock Exchange last week presented at least one welcome feature, and that was a fair increase in the volume of transactions. The tendency varied from time to time, with alternations of cheerfulness and depression. The opening day took the favourable line, actuated to a great extent by a recovery in the depressed American Market. Consols rose $\frac{1}{16}$; Railways and the Foreign Market were fairly bright; and Africans were better. In Gas, Tottenham and Bombay advanced. Tuesday was pretty active and cheerful. Buyers were tempted into the gilt-edged market, and Consols rose $\frac{1}{4}$; but Railways were rather weaker. Gaslight and South Metropolitan debentures advanced. Wednesday was not nearly so good. Rails were decidedly flat, and Americans were dull; but the gilt-edged class were still in demand, and foreign issues were fair. Buenos Ayres Gas advanced. On Thursday, things brightened up. Business in Home Government securities increased, and Consols rose $\frac{3}{16}$. Foreign stocks were good, and Americans calmer; but Railways could not mend. On Friday, after a fair opening, dulness supervened. Consols were lower, and many others dull. On Saturday, matters were tolerably active for an Autumn Saturday, and were fairly steady; but Consols fell another $\frac{1}{8}$. In the Money Market, there was no movement; the abundant supply for short loans, and the easy tendency of discount rates, remaining unchanged. In the Gas Market, there was fully shared the general increase in activity which characterized most departments. Prices were steady and mostly unchanged; but wherever there was a change, it was in the upward direction. In Gaslight and Coke issues, the ordinary was active at the old prices, transactions ranging from $104\frac{1}{8}$ to $104\frac{13}{16}$. In the secured issues, the maximum marked 88, the preference from 104 to 105, and the debenture from $85\frac{3}{4}$ to $86\frac{3}{4}$. South Metropolitan was much more active, with transactions at from 119 free to $120\frac{5}{8}$. The debenture made $85\frac{1}{4}$. Commercials were again untouched. Among the Suburban and Provincial group, Alliance and Dublin old changed hands at $18\frac{1}{8}$, Bradford old at 251 and $252\frac{1}{2}$, British at $43\frac{1}{8}$, Bromley "C" at $107\frac{3}{4}$, and Tottenham "B" at $110\frac{1}{2}$. In the Continental companies, business was quiet. Imperial showed only two or three bargains at 180 and $180\frac{1}{4}$, ditto debenture realized $96\frac{3}{4}$, Union from 95 to 96, and European was not dealt in. Among the undertakings of the remoter world, Buenos Ayres changed hands at 14, Cape Town debenture was several times dealt in at from $82\frac{1}{2}$ to 83, Monte Video realized $12\frac{7}{8}$, Primitiva $7\frac{1}{32}$ and $7\frac{1}{8}$, ditto preference $5\frac{1}{4}$ and $5\frac{5}{16}$, River Plate from $16\frac{3}{4}$ to 17, and ditto debenture $97\frac{1}{2}$ and 98.

ELECTRICITY SUPPLY MEMORANDA.

Municipal Accounts—Deficits and Slim Surpluses—Metallic Filament Effects—Power Profits and Other Points—The Finance of Metropolitan Municipal Undertakings—The Relief of Bath—Wiring and Fittings Powers Abandoned.

The accounts of most of the municipal electricity departments have now been published. Some of them show excellent surpluses; but the majority contain disfigurements caused by the depression of trade, the whittling down of consumptions by the metallic filament lamps, and the extension simultaneously of the demand for cheaper units for power purposes. If the accounts are examined in detail, it is seen that many an undertaking would have been in worse financial plight if costs had not exhibited a diminution. Coal cost less than in preceding years; and not a few accounts show the use of the pruning knife on the expenditure side of the revenue account. Supposing an increase in the price of coal at this stage when the consumption of the biggest profit-producing units is on the decline, and the low revenue-yielding power units are on the increase, and when many undertakings are finding their maintenance charges tending upwards, the result would be to largely swell the number of undertakings exhibiting deficits. There are several undertakings showing substantial deficits to-day; and a greater number that, partly by the assistance of the art of accountancy, exhibit a very lean profit. It would not take much in these instances to throw the balance to the other side under the sensitive and critical circumstances of the times. A complete list has not been compiled by us of such undertakings; but the one that has been prepared is sufficient to give point to the views formed from the survey of the financial statements. The electrical industry is fighting hard against altering established financial methods in the conduct of business; but the time cannot be far distant, if we read the signs rightly, when there will have to be a considerable change.

As illustration, among the undertakings that incurred deficits in the financial year 1908-9 are these: Acton had a loss of £4943 (against £2935); Barnstaple (after taking credit for £200 pupils' premiums), of £476; Bath, £1661; Batley, £308; Bridlington, £188; Dover, £1980 (the year before £2147); Hastings, £380[illegible] (previous year £2982); Marylebone, £3930; Middleton, £822; Morecambe, £2628; Morley, £1799; Stalybridge, Hyde, &c., Board (excluding the tramways), £528; and Sunderland, £2965, against £1908 (this town has had to face stern depression in the shipbuilding industry). From these particulars it will be seen that the towns with deficits are fairly scattered over the country;

and this is accentuated when the sample towns are quoted that were close on the division line between surplus and deficit. Among accounts exhibiting slender surpluses are these: Aldershot, £183; Bermondsey, £123; Bexhill, £536; Blackburn, £976 (against £1443 the previous year); Brighton, £564; Canterbury, £93; Cardiff, £311 (but there is an accumulated deficiency of £5851); Colchester, £269; Devonport, £790; Finchley, £86; Gloucester, £10; Govan, £528; Hornsey, £189; Ilford, £1 (!); Keighley, £30; Kirkcaldy, £147; Lancaster, £711; Leigh (Lancs.), £360; Mansfield, £700; Nelson, £36; St. Helens, £376; Southwark, £849; Stockton, £626; Warrington, £942; West Bromwich, £988; Weymouth, £101; Worcester, £160; Yarmouth, £194.

Several undertakings show largely decreased surpluses; an outstanding one being Manchester. The cotton strike, as well as the introduction of metallic filament lamps, has injured the business of several Lancashire undertakings. The total receipts of the Manchester concern amounted to £367,240, against £384,602 in the preceding year. The net surplus was £12,000, as compared with £19,543. Notwithstanding this, the sales increased by upwards of 3 million units, which is traceable to power supply. In this connection some remarks accompanying an analysis of the accounts in the "Electrical Times" are of interest: "As might be expected, the new business pertains almost entirely to the supply of energy for power purposes; and this, combined with a reduction in the tariff for lighting which came into force early in the year 1908, will account for the lessening of the average receipts by 0·14d. per unit—a figure insignificant in itself, but one which represents a diminution of no less than 10 per cent. Small wonder then that the gross profit shows a shrinkage of £22,000, and that the surplus, after allowing for increased charges, is affected to an even greater extent. . . . Although the amount set aside for renewals is smaller than for many years past, it is only fair to point out that the sum available for renewals and reserve is still in excess of £141,000." Glasgow is another interesting case. The accounts show a deficit of £3544; but this is after writing off £53,259 depreciation on capital account. Metallic filament lamps and bad trade caused the revenue to fall by some £8000; but there was a saving of working expenses amounting to £10,415. On the other hand, £4000 extra had to go to the sinking fund, and £3108 for depreciation. Leeds shows a net surplus of £47,566, which is a decline from £64,279.

The result of the adoption of metallic filament lamps by consumers is illustrated in most directions by the figures before us; and it has to be borne in mind that the end of consumption reduction, and the effects on capital expenditure of a lessened return per consumer, are not by any means yet within sight. Examples are: Blackburn reports an increase of only 2 per cent. in their total output of units, owing to the new lamps; Burnley had a decrease of 286,104 units; Croydon (with a decent surplus to be carried forward) reports that metallic filaments were responsible for an estimated revenue loss of £2000; Dover experienced a falling off in the sales to private consumers of 79,636 units; Hampstead announces a drop of £3000 in income; Hull records a drop of nearly £1000 on private lighting; Lancaster states that there was a decline of 4·33 per cent. in the units sold for private lighting, owing to the increased use of metallic filament lamps, and over the whole business the total increase in the units sold was only 0·47 per cent.; Leeds had a reduction of revenue from private lighting amounting to £7842; Manchester has been referred to in the preceding paragraph; Southport in the winter half of the year had a breaking away of 18,631 units for lighting; Sheffield had a decrease in the sale of lighting current by 196,175 units, and it is estimated that of this quantity 113,175 units were due to the use of metallic filaments, with a revenue decline of £4251 from the same cause; Yarmouth reports that the increase in the return from private consumers was only £4! There is no mistaking these figures. They have an imposing significance; and well it is recognized in the electrical industry, although not more than is necessary is publicly said about this aspect of municipal trading.

From the figures quoted in the preceding paragraphs, it is fair to assume that the metallic filament lamp is not serving as the impetus to increased business that the more enthusiastic station engineers had anticipated. Not many of the notices of accounts that have come before us give any indication as to the increase in the number of consumers. But as instances of slow progress, Blackburn states that the new connections last year only totalled 300; Brighton only secured an addition of 250; Gloucester, 43; and West Bromwich, 20. Of course, a difficulty of a no mean order that the electricity undertakings have to contend with is the improved efficiency of inverted incandescent gas-lamps. When a 50-candle power inverted lamp can be obtained that consumes only 2 to 2¼ cubic feet of gas an hour, and which will run from 450 to 500 hours on 1000 cubic feet of gas, such economical lighting is hard to beat. The increases of output of electricity during the year are mostly due to extensions of power supply; but what little effect this has had on the net surpluses of central stations is seen in several directions, typical of which is St. Helens. There a "considerable increase" is reported in the number of units sold for power, but the total income was only £285 more, and the surplus was merely £376. It would be interesting if one could see behind the scenes, and ascertain the experience of undertakings in regard to large consumers severing their connections from the town cables, and adopting private generating plants. St. Pancras reports the loss of several large consumers. The Marylebone Council are offering more seductive terms to prevent considerable consumers from installing privat plants. It is also noticed that several undertakings take substan tial sums from the ratepayers for electricity supplied for publi lighting. But Crewe must surely stand in a peculiar position with an income of £3799 from current sold by meter, and £3565—only £234 less—as the receipts for public lighting.

Dealing with municipal finance during the past year is a con venient opportunity for referring to a return recently published supplying some total figures for the year 1907-8 regarding th fifteen electricity undertakings owned by Metropolitan Borougl Councils. The net capital expenditure stood at £5,925,009. Th number of units sold was 61,931,061. The average price pe unit of the fifteen undertakings was 1·71d. for public purposes for private lighting, 3·43d.; and for power, 1·15d.—the average o the whole per unit being 2·49d. The average cost of productio was 1·20d. The gross profit realized—that is to say, before meet ing capital charges—was £336,533, or less than 6 per cent. Th total number of consumers was 28,846. The capital written o amounted to only £124,207; and, with the net capital expenditur standing at close upon 6 millions, only £30,879 was transferre to the reserve and other funds! This cannot be described as strong financial position.

The arrangement that the Bath City Council made with M Schenk on behalf of the Somerset Power Company, whereby th municipal undertaking was to be transferred to form the nucleu of the power concern, and in the event of non-performance of th agreement on the part of the Company a deposit of £2500 was t be forfeited, has turned out conveniently for the Council, thougl it has not relieved them of the concern that has been a sort o white elephant ever since they have had it, and has not paid fo the time expended by the civic fathers on its administration. Th Company did their very best to bring the scheme to a conclusion and it was only the refusal of the Board of Trade to sanction th bargain that it fell through. In view of the fact that it was no their fault that there was non-performance, it is rather hard on th Company that the Corporation should have pocketed the deposit and utilized it in making good accumulated deficits on the unde taking to the amount of £1659. About the costs to which th Council were put over the negotiations, they are fair deduction from the deposit—£283, cost of the negotiations, a vote of £15 to the Town Clerk, and there is still left a little over £100 t the good. It may be suggested that this should be utilized in buy ing Mr. Schenk some token of the appreciation of the Council, fo enabling them thus easily to clear off accumulated deficits.

The Electric Lighting Acts (Amendment) Bill has passed it third reading in the House of Commons; but it goes forward wit the entire wiring and fittings clause deleted. The event has show that, if the local authorities supplying electricity actually wante powers to carry on the wiring and fittings business without sub jecting themselves to attack by the Electrical Contractors' Asso ciation for doing something *ultra vires*, they would have don better to accept Lord Avebury's amendment (which made i obligatory upon them to carry on the business through loca contractors), than to have got their friends at the Board of Trad to induce the Commons Committee to erase the words whic curtailed their freedom. Those who were affected by the reve sion to the former position could not be conciliated; and th Board of Trade must have been heartily sick of the storm t which the modified clause gave rise. This was seen when th Bill was up for its third reading; for with nothing more than murmur of disapproval, the Parliamentary Secretary of the Boar accepted the amendment cancelling the whole clause.

Retirement of Mr. E. C. Riley.

After a service of rather more than twenty-two years in th capacity of Superintendent of the Gas-Works Department of th Great Western Railway at Swindon, Mr. E. C. Riley has retire from the position, in which, it may be remembered, he succeede Mr. C. E. Botley, who is now Engineer and General Manager o the Hastings and St. Leonards Gas Company. Prior to his ap pointment, Mr. Riley had been for some years with the Railwa Company. During the time he had charge at Swindon, the coa gas works there and at West London, Worcester, Milford Have (Neyland), and Didcot were either enlarged or improved; an oil-gas works were built and put into use at London, Swindo Bristol, Exeter, Worcester, Wolverhampton, Birkenhead, Ney land, and Cardiff, for supplying gas for train lighting and for dinin restaurant cars, &c. Many experiments were undertaken in trai lighting, with both coal and oil gas, with various types of burner culminating in the adoption of the "Bijou" inverted burner, con suming 0·65 of a cubic foot of gas per hour, and giving a ligh of from 20 to 22 candles. Before leaving Swindon, the esteem i which Mr. Riley was held was manifested in the way of presenta tions made by the staff and workmen of the Gas Department an other friends. He interested himself in the public life of Swindon and was a Justice of the Peace and a member of the School Boarc He has gone to live at Wallasey. We understand that for th future the gas-works will be under the supervision of the Manage of the locomotive works.

M. Rouland, the General Manager of the Paris Gas Com pany, has been made a Chevalier of the Legion of Honour. H was the founder of the Company formed in 1903 for lighting th suburbs of Paris and has rendered exceptional service in con nection with works for the manufacture and supply of gas.

PERSONAL.

Out of 68 applicants for the position of Gas Engineer and Manager to the Workington Corporation, rendered vacant by the death of Mr. George Keyte, three were selected as being the most suitable; and, as the result of further consideration, the appointment has been conferred on Mr. E. G. Hutchinson, the Assistant Manager and Engineer at Stockport.

At a recent meeting of the Chesterfield Water and Gas Board, the Sub-Committee who had considered the question of appointing a General Manager recommended that Mr. J. W. B. Simpson, the present Accountant, have the control and management of the commercial department of the gas and water undertakings, and that he be styled Accountant and Commercial Manager.

The staff of the Coventry Corporation Gas Department have just presented Mr. Charles Matthews, one of the members, with a silver table centre and cake-stand, on the occasion of his marriage. The presentation was made by Mr. J. A. Noble, the Accountant of the Department, who spoke of the high esteem in which Mr. Matthews was held by the staff, and tendered to him their best wishes for his future happiness and welfare. These sentiments were endorsed by Mr. Fletcher W. Stevenson, the General Manager, who presided, and were suitably responded to by Mr. Matthews.

SOME GAS EXHIBITS AT OLYMPIA.

It is difficult to imagine an exhibition—save, perhaps, a purely electrical one—where a display of gas apparatus of one form or another would not be in perfect harmony with its surroundings, inasmuch as gas possesses advantages for practically all purposes under almost any conditions. In a social or industrial exhibition therefore it would be a disappointment to find gas entirely unrepresented. This disappointment, however, will not be experienced by visitors to the "Exhibition of Women's Work in all Spheres" which is now being held at Olympia; for there the domestic uses of gas are well demonstrated. One section of the exhibition is devoted to the work of the National Society of Day Nurseries; and here both a model and a working *crèche* are fitted with gas heating and cooking appliances, which were supplied and fitted by the Gaslight and Coke Company. There is in the working *crèche* a double "Surrey" condensing stove for airing; a large Ewart "Califont" geyser which furnishes an unlimited supply of hot water; a Fletcher "Malta" griller, which is specially adapted for warming food, by the provision of a small burner in the centre of the boiling-ring; and a Richmond cooker. The model rooms are fitted with a Ewart "Lightning" geyser, and three fires—a Main "Worcester," a Richmond "Bavarian," and a Wilson "Sheraton." In another portion of the annexe, the St. Clement's Nursing Institution have model rooms in which the Gaslight and Coke Company have placed a Maughan "New Teba" geyser and a Davis "Gascol" range. Here are to be noticed some paper bags of coke containing 28 lbs. each, priced at 4d. In the office of the Day Nurseries Society an installation of acetylene gas lighting has been fitted up. One of the stalls in the body of the hall is occupied by Messrs. S. Clark and Co., who make a representative display of their "Syphon" stoves; and on another are to be seen Hutchings's steam-cookers, which are eminently suitable for use on gas-stoves.

AN ENGINEERING DAY

At the White City.

Under the presidency of the Lord Mayor of London (Sir George W. Truscott), an "Engineering Day" was held last Saturday at the Imperial International Exhibition, Shepherd's Bush. It was organized by the General Mechanical Engineering Committee, the Mining and Metallurgical Committee, the Building and Engineering Construction Committee, the Institute of Marine Engineers, and the Cornwall Mining Committee. The arrangements were in the hands of an influential Joint Committee, under the chairmanship of Mr. W. Worby Beaumont; and the Hon. Secretary was Mr. W. Yorath Lewis. The reason advanced for the gathering was that the various Committees of the Engineering Section of the Exhibition felt that those interested in engineering in its great variety of branches seldom have any opportunity of meeting together under circumstances that combine the social and technical advantages of a general congress. Moreover, it was considered that such a congress might be productive of good service in the interest of the engineering community as a whole, inasmuch as there are a large number of Technical Societies serving useful purposes in a somewhat limited field which might be considerably increased if there existed better opportunities of associating with kindred Institutions.

Beyond these general considerations, there was only one item in the day's proceedings of special and particular interest to the gas engineering profession. During the afternoon, there was a series of six lectures and papers read in the Congress Hall; and one of these was by Mr. Percy Allen, on "Large Gas-Engines." The value of this lecture (which was much appreciated by those who were present) was enhanced by a large number of lantern slides. An abstract of it will be found on p. 635. There was a pause in the business proceedings while the Lord Mayor held a reception on the terrace of the Imperial Tower; but there were numerous parties in different parts of the grounds, bent on the work of inspection, who were unable to get back for this ceremony. As, also, the papers read dealt with widely different subjects, the audience was to a considerable extent different for each one. There was thus no opportunity of seeing all the engineering visitors together at one time to form an estimate of the attendance. Certainly, there was a very fair gathering, drawn from the members of a great many different societies; but should the actual numbers prove to be smaller than was anticipated by the organizers it would not be at all surprising, considering the inclement weather that was experienced. In any event, the idea with which the gathering was organized has been approved in many quarters.

There were a number of special demonstrations in the Machinery Hall; and a very popular item of the programme was an inspection of the construction and operating mechanism of the numerous examples of mechanical and structural engineering to be seen in connection with the different "amusement" devices. To a considerable extent, these consist of the hauling of cars, &c., to the top of an incline, and then allowing them to run down in various more or less startling fashions. Probably few of those who undergo the experience of a ride ever give a moment's thought to the motive power employed for raising them in the first instance to the summit; but this was a matter which created considerable interest on Saturday. Of course, the well-known Flip-Flap is electrically operated, as also are a good many of the other "side-shows;" but there are at the same time several cases in which gas-engines are employed. For instance, in the Spiral Railway the cars are pushed up the circular path by means of a chain-driven revolving shaft operated by a 26 H.P. gas-engine. In connection with the Canadian Toboggan and the Wiggle-Woggle the haulage is carried out by continuously running cables to which the cars or tubs are attached as required; gas-engines of 16 H.P. and 20 H.P. respectively being employed for the purpose. All these three engines, it should be mentioned, are by Messrs. Tangye. Then in connection with a model bakery there is a Hornsby-Stockport engine using suction gas, which drives a dynamo; the producer gas being also burnt under the ovens for baking biscuits, &c. For the Scenic Railway, suction gas is used, the cars being elevated by wire ropes; while on the Mountain Railway, the cars themselves are provided with electric motors. The petrol-driven tramcars, which one now has to dodge in the grounds of the Exhibition, hold thirty passengers, travel 8 miles an hour, and are of from 35 H.P. to 40 H.P. While making the tour of inspection, those who kindly acted as guides drew attention to the high-pressure gas lighting plant. The excellence of the illumination given by these lamps in the evening time, both in the Machinery Hall and in a portion of the grounds, was also pointed out.

In the evening, a largely attended banquet took place in the Garden Club. The chair was occupied by the Hon. Arthur Stanley, M.P., who, in proposing the toast of "Engineering," said he thought that those who lived in the present age were much-favoured individuals, because there had been witnessed in the last few years probably the most interesting developments in almost all forms of engineering that the world had ever seen; but the next ten or twenty years might be more eventful even than the last. One often heard that England was falling behind in the race, and that other nations were going ahead; but he thought it could be shown that, at all events in engineering, England, Scotland, and Ireland were not only holding their own, but were doing more than this. Mr. Worby Beaumont, Mr. F. S. Courtney, and Mr. J. W. Orde replied. Mr. Courtney remarked that the field covered by engineers was a very wide one; and so there must be specialization. This was one of the forces in getting the gathering together, because, although there might be two or three large Engineering Societies which claimed to have the profession as it were under their wing, there were fortunately a great number of kindred Societies working independently. He trusted they would continue to work independently, because they would possess more vitality and more originality as long as they had a perfectly independent existence. But this was no reason why there should not be closer intercourse between them all; and it was the idea of bringing together the different Societies and different branches in an informal manner which led the Engineering Committee to institute this gathering, which he thought they would all agree had been a highly successful one. He hoped it was the first of what might prove to be an annual meeting. They were greatly indebted to the Hon. Secretary (Mr. Lewis). Several other toasts were submitted, among them being "Architecture and Building," which was proposed by Sir John Cockburn, who remarked that as time went on building and also architecture became more and more engineering problems.

Concrete cable conduits have been in use during the past three years in St. Louis, by the Union Electric Light and Power Company. The individual ducts are U-shaped with flat tops, and the moulds consist of 16-feet sections of lumber, dressed to the U-shape, and held down by suitable weights in the duct form supports, which have previously been set to grade and aligned in the bottom of the trench. Concrete is then dumped into the trench, suitably rammed and puddled round the forms, and finally struck off level with the tops of the moulds. After the concrete has set, the moulds are removed by lifting them up and out of the concrete.

GAS-ENGINE AND ELECTRIC MOTOR FAILURES.

The annual report of the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited (Mr. Michael Longridge, M.A., M.Inst.C.E.), is before us; and it is in its substance of the usual didactic order. In mechanical plant, failures stand for much in giving instruction; and the recounting of the details leading up to them serve as warning to owners and users, and show what to avoid, and what to look for. The section of the report devoted to actual practical experiences in respect of mishaps with internal combustion engines is not so extensive as it has been in former years, owing to Mr. Longridge devoting a considerable part of the available space to the discussion of formulæ for making a close estimate of the stresses upon engine-shafts. This is important in view of the number of breakages of shafts—amounting to 9 per cent. of the total number of gas-engine breakdowns in the year—and to the variety of dimensions adopted by different makers.

Prefacing the parts referring to the failures, it is of interest to note that the rate of increase in the Company's business in the insurance of internal combustion motors has practically reached the same level as that of steam-engines. Four years ago there were 27 steam-engines insured for every 20 gas-engines. In 1907, there were 26 steam-engines for every 20 gas-engines. Now the relation is about on a level. Still Mr. Longridge has no doubt that while small steam-engines have had to give place to gas-engines, gas-engines in their turn have had to make room for electro-motors. But for these, the increase in the number of internal-combustion engines insured would have been greater. The ratios of breakdown of steam and gas engines were in the year approximately equal—viz., 1 in 9·4 and 1 in 9·1, as against 1 in 11·7 and 1 in 11·1 in 1907. The proportions in which the various parts of the insured gas and oil engines broke down in 1908 are given in the last column of the following table:—

Description of Parts which are Believed to have Given Way First.	Average Previous to 1907.	During 1907.	During 1908.
	Per Cent.	Per Cent.	Per Cent.
Valves and valve gear	32·5	43·3	31·3
Cylinders and cylinder ends	16·6	13·5	19·4
Pistons	11·7	2·7	4·8
Connecting-rods and their bolts	11·2	8·1	10·8
Main shafts	5·0	4·7	9·1
Governors and governor gear	4 4	7·4	4·8
Silencing-boxes and exhaust-pipes	4·4	1·4	2·4
Fly-wheels and driving-drums	4·3	4·7	5·4
Clutches and couplings	3·5	0·0	0·0
Frames and pedestals	2·8	4·0	1·2
Bolts*	2·6	1·4	2·4
Total wrecks, cause not ascertained	1·0	0·0	0·0
Main driving ropes or belts	0·0	0·0	0·0
Miscellaneous	0·0	5·4	5·4
Gas-producer plants	0·0	3·4	3·0
	100·0	100·0	100·0

* These bolts do not include bolts in connecting-rods, valve-gear, and other moving parts; the bolts in these parts being included with the parts themselves.

The causes of these breakdowns may be roughly classified:

Accident and causes unascertained	35 per cent.
Old defects or deterioration by wear and tear	20 ,,
Weakness, bad design, workmanship, or material	18 ,,
Negligence of owners or attendants	27 ,,

In the first table, there is again evidence of weakness in the design and manufacture of valves and valve gear. There is also a considerable increase in the percentage of cracked cylinders and cylinder ends; but this is principally due to the severe frosts at the beginning and end of the year, whereby many jackets left undrained and exposed were cracked. The breakdowns from fracture of connecting-rods and their bolts (in nearly every case the bolts) were also more numerous than in 1907, though below the average; but breakages of crank-shafts were more frequent than in any previous year, except 1906. For this no reason can be given.

Only two examples of gas-engine breakdowns are given; and they are chosen because typical of two of the weak points in gas-engine design—connecting-rod bolts and fly-wheel keys.

The first is the case of a horizontal gas-engine, with cylinder 20 inches diameter by 2 ft. 6 in. stroke, running at 180 revolutions per minute, with producer gas. The big end of the connecting-rod was of the marine type, with round-backed gun-metal steps; the cap being held by two steel bolts, 2 inches diameter, screwed with Whitworth standard threads. There were no fillets at the junctions of the shanks and heads, nor were the shanks reduced in diameter between the heads and the screw-threads. Thus the smallest diameter of each bolt was the core diameter of the thread. The engine was started about the end of August, 1907. Soon afterwards the cylinder end cracked, but was temporarily repaired, and kept at work while a new cylinder was being got ready. This was put in early in 1908; and the engine then ran till the beginning of February, when both the bolts in the big end of the connecting-rod gave way at the junction of the shank to the head. In the one which probably broke first, fracture had evidently commenced some time before the final break, and had extended gradually through the metal; for, with the exception of a small area, the surfaces of the fracture were smooth and black with oil. In the other the break was new, and had probably happened after the first-mentioned bolt had finally given wa Its surfaces were clean and fresh, and composed of large crystal The cause of the original crack which led to the first failure w probably the sharp corner at the junction of the head and shan The stress put upon the bolts by the inertia of the moving par was about 3000 lbs. per square inch. Previous to the breakdow the engine had made about 11 million revolutions. The dama done was considerable. The cylinder end, piston, and bed-pla were broken beyond repair, the liner was damaged, and the co necting-rod bent. After the breakdown, the bolts in the big en of the connecting-rod of another engine belonging to the sam firm, and made the same way, were examined; and an incipie crack was found with the aid of a magnifying glass at the junctic of the head and shank of one of them. Probably the majority the bolts in connecting-rods of the marine type are made witho fillets under the heads; but the additional bearing surface gaine thereby is not sufficient compensation for the risk involved.

The second example is a horizontal gas-engine, five years ol with cylinder 8½ inches diameter by 51-inch stroke, running 176 revolutions per minute, with lighting gas from a town mai The engine had one fly-wheel, 5 ft. 6 in. diameter, with six curve arms, aud boss 7⅜ in. diameter by 7 3/16 in. wide, bored to 3½ inche diameter to receive the crank-shaft, to which it was secured b one key, 8½ inches long, ⅞-inch broad, and ⅝-inch thick, with gib head. The depth of the keyway in both shaft and boss wa 5/16 inch. In 1907, the key broke inside the boss 2¾ inches fro the head end; and both it and the key-bed in the shaft wer found battered and slightly worn at the edges. Evidently th wheel had been rocking on the key. The owner of the engin was advised to have the wheel taken off the shaft and the key ways in both machined to true plane surfaces; but he decline to keep the engine standing longer than was necessary to g a new key driven in. The new key was made, and driven u tightly, and a tin shield which covered the end of the shaft an the side of the boss was refixed. The engine ran for nine month when the wheel became so loose as to attract attention. Whe the tin shield was removed, the side of the boss which it ha covered was seen to be cracked radially from the leading corne of the key-way. The side next the engine was still sound. Ther was also a longitudinal crack in the shaft parallel to the trailing c driving edge of the key-way. The key was loose, and easily drive out; but the wheel was firmly fixed, and was forced off with diff culty. It was then seen that the crack in the shaft extended th full length of the key-way, parallel to it, and about ⅜ inch from i and that the metal between it and the key-way had risen suff ciently to bind the wheel. The fact was that the trailing side c the key—*i.e.*, the driven side—had forced back the face which wa driving it and sheared the material that lay immediately behin The key and key-beds were worn round; and the diameter of tha part of the shaft on which the boss of the wheel had been ridin was reduced nearly 1/32 inch, except where the partly-sheared ma terial behind the key, and between it and the crack, had bee forced outwards by the pressure of the key. This case is selecte for description because the partial shearing of the shaft, the flo of the steel behind the key-way, and the longitudinal crack ju about where the plane of the key-bed would cut the circumferenc of the shaft, differentiate it from the ordinary cases of rockin wheels and consequent split bosses.

With regard to the inspection and insurance of electrical ma chinery, the business (we learn from the report) again shows satisfactory increase in the number of insurances; but, alas! als in the number of breakdowns, and in the cost of repairing th damage done. The percentages of increase shown by the figure for 1908 over those for 1907 are:—

	Dynamos.	Motors.	Starters or Controllers.	Totals.
Insurances	13·8	10·8	14·3	11·4
Breakdowns	13·0	8·2	18·2	10·7
Cost of damage	84·8	7·7	4·0	18·3

The great increase in cost is, Mr. Longridge thinks, probabl temporary rather than chronic; being due to a few expensiv breakdowns of large generators. The ratios of breakdown amon the various classes of machines were these: Dynamos—Direc current, 1 in 13·7; alternating current, 1 in 5·7. Motors—Direc current, 1 in 9·2; alternating current, 1 in 11·3. Starters and con trollers, 1 in 24.

As motors form by far the largest proportion of the machine insured, the proportions in which the parts caused or initiate breakdown in 1908 are tabulated separately, thus:

Description of Part which is Believed to have Failed First.	Direct Current Motor.	Alternating Current Motor.
	Per Cent.	Per Cent.
Rotating parts carrying current—		
Armatures or rotors	38	21
Commutators or slip rings	29	2
Stationary parts carrying current—		
Magnet or stator coils	11	53
Brush gear and terminals	6	0
	84	76
Rotating parts not carrying current—		
Shafts, spiders, cores, binders, pulleys, gear-wheels, &c.	9	6
Stationary parts not carrying current—		
Frames, pole pieces, bearings, &c.	7	18
	100	100

The causes of the year's breakdowns were in all probability the following:—

—		Dynamos.		Motors.		Starters.	
		1907.	1908.	1907.	1908.	1907.	1908.
Accidental	per cent.	8	6	4	4	9	8
Dirt and neglect	,,	25	23	28	30	16	17
Age and deterioration	,,	23	25	23	20	27	25
Bad work or design	,,	21	20	18	11	8	9
Overloading	,,	0	0	1	1	5	2
Unascertained	,,	23	26	26	34	35	39
		100	100	100	100	100	100

A few of the breakdowns attributed to each of these causes are described in the report to illustrate the kind of cases that the Company have to deal with every day—frequently at the rate of one per hour.

ZURICH GAS UNDERTAKING.

Past Year's Working—Vertical and Inclined Retorts.

We have received, through the courtesy of Herr Weiss, the Engineer of the Zurich Corporation gas undertaking, a copy of the report for the past year, from which we have abstracted the following information of especial interest to "JOURNAL" readers.

The constructional work in hand was brought to a close in the course of the year. The coke breaking and sorting plant was completed on a larger scale than had been originally intended, in consequence of the experience gained in the preceding winter. A special screening plant of a capacity of 20 tons per hour was erected for dealing with the coke from the vertical retorts. A new pump was installed for removing the underground and sewer water during the periods when the River Limmat is in flood. The experimental gas-works were brought into use in the spring; and in the course of the year a number of investigations were carried out, not only for the purposes of the Zurich undertaking, but also in some cases for the information of other gas undertakings using vertical retorts. The distributing system was considerably extended during the year.

A statement is given of the number of days during which the various benches of inclined and vertical retorts were in action. As illustrating the durability of the Coze settings of nine inclined retorts, it may be mentioned that the renewal of these retorts was undertaken in the case of one bench after they had been in action for 1538 days, and in the case of another bench after 1974 working days. There are two benches, each containing five beds of ten vertical retorts on the Dessau system. The use of these retorts has had the effect of raising the average make of gas per ton of coal carbonized from 10,891 cubic feet in 1907 to 12,079 cubic feet in 1908. The following tabular statement of the comparative working figures for the inclined retort-settings in No. 2 retort-house and for the vertical retort-settings in No. 2 retort-house shows the relative advantage of the vertical system at Zurich:—

TABLE I.

1908.	Metric Tons Carbonized.		Make of Gas per English Ton.	Weight of Retort Charge.	Weight Carbonized per Retort per Diem.
	Coal.	Cannel.	Cubic Feet.	Lbs.	Lbs.
Inclined retorts	43,140	1005	10,945	428	2007
Vertical retorts	41,554	..	13,281	1081	2551

The larger make of gas from the vertical retorts is, of course, mainly due to the production of water-gas therein; but the effect has been to greatly economize the consumption of coal, which, notwithstanding an increase in the make of 9·2 per cent., has fallen from 85,640 metric tons in 1907 to 84,694 metric tons of common coal in 1908. The consumption of cannel has similarly fallen from 1384 to 1005 metric tons. In the table, the figures in the last two columns are averages, exclusive of the retorts out of action for scurfing. There was a slight reduction in the cost of coal delivered to the works as compared with the previous year. In 1908, the coal cost, including all charges up to the retort-benches, about 28s. 6d. per ton. The vertical retorts also effected great economy in labour, since the number of shifts of men was reduced from 16,235 to 11,998, notwithstanding an increased make of 9·2 per cent. The make per shift was increased from 57,456 cubic feet in 1907 to 84,906 cubic feet in 1908. Taking the two classes of retort-settings, the make per shift averaged 53,069 cubic feet for the inclined retorts, and 178,777 cubic feet for the vertical retorts. The wages paid per 1000 cubic feet of gas made fell from 1·85d. in 1907 to 1·77d. in 1908.

The gas sold to private consumers showed an increase of 10·58 per cent. over that for the preceding year. The unaccounted-for gas fell from 4·89 to 4·64 per cent. of the make. The gas sold for cooking and heating purposes to private consumers amounted to 57·77 per cent. of the make, compared with 55·84 per cent. in 1907. The total make of gas in the year amounted to 28,843,500 cubic metres (about 1,018,637,050 cubic feet). The outlying communities supplied from the Zurich works took 3·90 per cent. of the gas made. The consumption of gas in Zurich itself, exclusive of public lighting, amounted to 4686 cubic feet per head of the population, which is a considerable advance on the consumption per head in previous years. The coke used for heating the retorts was 19·85 per cent. of the coke made. The consumption of coke in the vertical retort-settings, in percentages of the weight of coal carbonized, amounted to 13·9 when no steam was introduced into the retorts, and to 15·0 when steam was admitted. Having regard to the introduction of vertical retorts during the year 1908, the following statement of the average yields of bye-products, in percentages of the weight of coal carbonized, for the past three years may be of interest.

TABLE II.

—	1908.	1907.	1906.
Coke	72·948	70·106	73·367
Real ammonia	0·2279	0·2063	0·1975
Tar	6·044	6·260	6·318
Thick tar (pitch)	0·308	0·237	0·366
Producer clinker	3·410	4·150	3·680
Retort-scurf	0·071	0·060	0·093
Prussian blue	0·067	0·1155	0·0829

On the whole, the prices obtained for bye-products were lower than in the previous year, though prussian blue and retort-scurf realized rather better figures. The work done by the laboratory staff included the control of the heats of the vertical retort-settings. They were controlled in a threefold manner: (1) By keeping the draught constant, at about 4-10ths of an inch at the outlet of the setting; (2) regulating the position of the primary-air valve throughout, so that just a feeble blue point, indicating the presence of carbon monoxide, was perceptible after the regenerator; and (3) taking the temperature of the setting once or twice a week with a Wanner pyrometer. The maximum temperature at the bottom sight-hole should be 1375° C.

The gas made was, as in the previous year, washed with anthracene oil for the extraction of naphthalene. The consumption of oil was, however, reduced to nearly half that of 1907, owing to the gas from the vertical retorts being relatively free from naphthalene. The sludge from the cyanogen washers showed a considerably lower average yield of prussian blue from the gas, due to the lower proportion of cyanogen in the gas made from the vertical retorts. The yield of prussian blue fell from 1674 grains per 1000 cubic feet in 1907 to 791 grains in 1908. The purifiers were charged only with Giulini purifying material, which had been found to act more rapidly, and to have a longer life than ordinary oxide. This material contained on the average 45 per cent. of moisture and 67 per cent. of ferric hydrate reckoned on the dried material. The spent material contained on the average 6·1 per cent. of moisture, 65·2 per cent. of crude sulphur, 2·1 per cent. of prussian blue, and 0·35 per cent. of ammonia. This compares with 44·9 per cent. of crude sulphur in a Dutch oxide. Great care has to be used, however, with the Giulini material, in order to avoid ignition during revivification. A purifier charged with it remained in action for eight months, dealing with upwards of 350 million cubic feet of gas. It had to be put out of action on account of the high pressure which it began to throw, and not because the purification was faulty.

Carbonizing tests were made in the experimental plant on 29 German and 15 English coals for the use of the Zurich Gas-Works; and on 33 German, 26 English, and 15 coals of unknown origin for other gas-works. It was found that the coke from the vertical retorts was considerably less porous than that from other retorts. The specific gravity of the former coke was 1·88, and the weight of unit volume, 0·448; whereas the specific gravity of the coke from the inclined retorts was 1·83, and the weight of unit volume 0·363.

The net profit on the year's working was 1,183,828 frs. (£47,353), which is 182,583 frs., or £7303, more than the profit for the preceding year.

Removal of Naphthalene from Illuminating Gas.—In a recent number of the "Journal für Gasbeleuchtung," the subject of the determination of naphthalene in illuminating gas, and its removal by cooling, was dealt with by Herr J. Rutten. According to an abstract in the "Journal of the Society of Chemical Industry," naphthalene in illuminating gas may be determined by a modification of Colman and Smith's method, in which the solution of picric acid used is saturated, and contains crystals of the acid. When lighting gas is passed through this solution, the formation of the insoluble naphthalene picrate is quantitative without further treatment; and after diluting the solution and redissolving the picric acid, the solution may be titrated immediately. The removal of naphthalene by washing the gas with tar is the more effective the lower the temperatures of the gas and tar, since the vapour pressure of naphthalene decreases with temperature more rapidly than its solubility in tar. In the author's tests, the gas was cooled by means of chambers separated from the retorts by about 720 feet of pipe. With the inlet and outlet temperatures of one of the coolers varying from 51° C. and 22° C. to 63° C. and 41° C. respectively, the quantity of naphthalene in the gas entering and leaving the cooler varied from 1·142 and 0·564 grammes to 1·950 and 1·44 grammes per cubic metre. It was also found that 50 per cent. of the tar and 70 per cent. of the naphthalene were removed in the cooling chambers.

PRE-HEATING AIR SUPPLY TO BUNSEN BURNERS

By H. James Yates, F.C.S., of Birmingham.

I have been very much interested in the statements which have recently appeared, both in the "Journal" and also in connection with manufacturers' advertising matter, in regard to the percentage of gas which can be saved, particularly in gas cooking-ovens, by pre-heating the air which is supplied to the bunsen burners. We have just completed some searching tests in our laboratories in respect to one apparatus of this kind which has lately been brought prominently before the public notice, the results of which I believe will prove of interest.

I was convinced, as the result of our previous work and experiments in this direction, that the statements to which I have referred were excessive. I did not, however, anticipate that these were so wide of the mark as they have proved to be by our tests, which are set forth in the following figures:—

	Oven as Sent out by Makers Arranged for Pre-Heating Air Supply to Bunsens.		Ordinary Gas Cooking-Oven with no Pre-Heating Arrangement.	
	Deg. C.		Deg. C.	
Mean temperature—				
At top of oven	246·4	..	249 7	
At bottom of oven	230 6	..	282·2	
Of escaping products of combustion at flue	117·0	..	161·4	
Between walls of oven where air is pre-heated for supply to bunsen burners, right-hand side	162·2	..	—	
Do., left-hand side	153·0	..	—	
Of outside walls of oven, right-hand side	74·4	Mean 77·9	55·6	Mean 57·5
Do., left-hand side	81·4		59·4	

During the whole continuance of our experiments, the calorific value of the gas was taken from time to time, and averaged. From the figures thus obtained under readings (after correction to 0° C. and 760 mm.), the number of B.Th.U. used per hour was calculated. The burners of the oven supplied with pre-heated air were left as sent out by the makers; but in the case of the oven which we used for the comparative tests, they were adjusted so as to consume exactly the same amount of gas per cubic foot of oven space as the oven with pre-heated air.

In theory, and under particular conditions, the pre-heating of air for the supply of oven-burners is not without a certain advantage. But, unfortunately, it is not practicable on a commercial basis to construct cooking-ovens and similar low-temperature apparatus with that degree of refined exactitude which is absolutely necessary to attain the desired effect; and, therefore, any increase of value gained in this way is necessarily too small to be of much practical use.

Referring to the foregoing figures, it will be noticed that though the mean temperature of the interior of the ordinary oven was 50° C. higher than that of the pre-heated oven, the temperature of its outer surface was 20° C. lower. This means that with the pre-heated oven there is considerable loss of heat. This fact, which may at first sight seem difficult to account for in face of the economy intended to be effected by the pre-heating, is less difficult of explanation after allowance is made for the unavoidable admission of extraneous air which is not pre-heated, and when there is taken into account the much greater loss in radiation on account of the higher temperature of the outside walls of the oven, which has no non-conducting jacket beyond the pre-heated air that is on its way to the burners. This increased loss in radiation was a result quite to be looked for, having regard to the fact that the air-jacket is not a sufficiently good non-conductor, and allows heat to pass through it to the outer walls of the oven. From there it is lost by two means—convection and radiation. The loss by convection is considerably more in the pre-heated oven than it was in the ordinary oven; for while both ovens were continuously heating the air immediately in contact with their outer walls, the pre-heated oven, on account of the higher temperature of its outer walls (owing to the absence of the slag-wool jacket), was raising this outer air to a temperature anything up to 20° C. more than was done by the ordinary jacketed cooker. The difference between the respective losses by radiation—such as these losses are—is, of course, very much greater than that between the respective losses by convection; being, in fact, proportional to the difference between the fourth powers of the absolute temperatures.

These tests confirm the view that any small initial gain from pre-heating the air for the cooking-oven burners is more than neutralized by the loss in other directions.

Durability of Cast-Iron Mains.—In an article on the rusting of iron, with special reference to the corrosion of the Rochester (N.J.) steel conduit, in the current number of "Engineering," emphasis is laid on the great durability of cast-iron mains. It is stated that M. Cavallier, of the Pont-à-Mousson foundries, has recently compiled some interesting records which testify to this. Some flanged pipes, taken up in Paris a few years ago, and bearing the mark "Creusot, l'an 10" (*i.e.*, 1802), were found still in serviceable condition. Some of the 20-inch mains for the Versailles fountains, laid between 1668 and 1688, are still doing duty, only the flange-bolts having required repairs. Clermond-Ferrand is served by water-mains laid down in 1748.

OBSERVATIONS AND ADVICE ON SHOP LIGHTING

[Communicated.]

No customer cares to enter a dim or dark shop. He likes brightness, and wants to see what he is buying; and he frequentl thinks that poor illumination means poverty of stock. The ligh ing of a shop helps either to make or mar a business. Good an effective illumination, attracting attention, acts as an exceller advertisement; and its absence may mean the loss of possibl customers. A well lighted shop is usually noted for cleanliness dirt and untidiness are too easily seen to allow assistants to go slovenly. Brightness, cleanliness, and smartness are consequentl the direct results of effective lighting; and they all have a usefu though perhaps insensible, effect upon the customers, to the ad vantage of the tradesman.

While good illumination is a necessity, inoffensive illuminatio is not less so. The lighting should not be obtrusive; for glarin illuminants are a mistake. Visits are repeated where shopping i done comfortably. It is annoying to a customer to examine a article with a brilliant light shining directly or being reflected int his eyes, forcing the article to be held first one way and then th other in order to avoid glare. Customers are thus conscious o discomfort, and get little pleasure from their shopping. Th problem of the progressive tradesman, therefore, is to satisfy hi customers' unspoken requirements, as well as to light his busines premises adequately, and yet, in view of the stress of competi tion, to keep his expenses within reasonable limits. A few hint on intensity, character, and method of illumination may help i its solution.

Generally speaking, in the selection of lamps attention shoul be paid to their size compared with that of the shop or roon in which they are to be used. A sense of proportion is alway pleasing. Large and powerful lamps are suitable for spaciou shops, but look ridiculous and are unnecessary in small places Light-sources should be carefully distributed, so that the illumina tion may be uniform; thus simulating the evenness of diffuse daylight. Patchiness of illumination should be avoided, for rela tive light and shade do not look well in a place of business Where extra light is specially wanted, it can be added by using a rather more powerful burner or cluster of burners at the poin required.

Care should be taken that the lights are not too strong or to prominently placed, otherwise the eyes are uncomfortably dazzled Much, of course, depends upon the purpose to be served; bu effective shop lighting can be done by means of pendants eithe of a single burner or a cluster of burners symmetrically arrange according to the size and shape of the place and the nature o the business. A good example of this was given in an article on "Shop and Window Lighting" in the "Journal" for Feb. 25, 1908 Either vertical or inverted burners, as desired, may be used i this way. This method of lighting is not expensive. If a cluste of (say) three "C" incandescent burners is employed, a light o about 180-candle power will be obtained for just over ½d. pe hour, assuming the price of gas is 2s. 6d. per 1000 cubic feet. I the case of the equally suitable inverted burners, the cost is, i anything, even less. The conditions of the shop may be such a to render large units of light advisable. There are on the marke many high-power lamps which, being on the self-intensifyin system of gas lighting, give much greater candle power with a improved duty per cubic foot of gas consumed.

A useful rule as to the quantity of illumination required fo shops has been given by Mr. F. W. Goodenough, the Chief In spector of the Gaslight and Coke Company. It allows 30 to 50 candle power for every 1000 cubic feet content of shop; the exac amount varying according to the colour of the ceiling, walls, goods and general surroundings. The same authority advises tha lights should be spaced about one-and-a-half to twice their heigh from the floor level. For instance, if lights are 7 feet high, the spacing should be from 10 to 14 feet.

In deciding upon the general character of illumination, the following points are worth bearing in mind. The brightness o the light should vary to some extent with the nature of the merchandise. Dark heavy goods—such, for instance, as men's clothing, leather articles, furniture, &c.—require very strong illumination; white or light-looking articles, on the other hand, do not need too intense a light. In the same way, if a shop has several departments, the lighting of the darker rooms, or rooms containing dark-coloured goods, should be much greater than that of light rooms. Otherwise, if the actual illumination is equal, the customers, in going from light-coloured goods or rooms, will feel comparative gloom, and therefore be somewhat chilled when entering the departments where there are heavy-looking or dark-coloured articles.

With reference to shop windows, it may be said that without them and their contents the shop might as well be shut up. The window is so potent an advertisement, that an effective display—and this can only be achieved under the best light conditions—is of the highest importance to the proprietor. In many cases shopkeepers now prefer to leave their windows exposed and lighted long after the shop is closed; and it can be quite understood that it answers their purpose to do so. Good window illumination is, therefore, particularly advisable; and, since it may be required for long hours, economy is of considerable consequence.

In the article referred to, illustrations were given showing

how really good window lighting might be economically obtained. In the first case, a row of twelve inverted gas-burners were suspended near the top of the window. They were equipped with reflecting shades throwing the light downwards and well back into the window. The lamps were practically out of sight, and consequently did not try the eyes. The burners gave a splendid light with a total gas consumption per hour of 36 cubic feet, costing about 1d. Inverted burners are admirably adapted to window illumination because of their brilliancy, the downward direction of the light, and the ease with which they can be applied to existing conditions. In another case, the "deck," or window ceiling, lighting shown permitted of the window being sealed; and as the "deck" was transparent or translucent, the light from inverted burners could be well and evenly distributed. The lamps in this example consisted of inverted burners with mirror glass reflectors. There was no heat in the window itself. Practically anything can be shown in this way. All these lights can be operated by means of pilot jets and a switch.

It should be noted that in the lighting of windows it is always best to have the lamps as far as possible out of the direct line of the eyes. Studding the sides and back of a window with lamps distracts attention from the goods exhibited. If side lamps are used, they should be provided with reflector shields, which will also serve the purpose of directing the light on to the goods. In some cases, such as china and ironware, the lighting can be supplemented, if required, by several shaded footlights.

Where window dressing does not allow of inside lighting, outside reflector lamps can be adopted with advantage. Wind-proof lamps are obtainable which will adequately light the windows at the low cost of from ¼d. to ½d. per hour for each lamp. A rule of 50 to 100 candle power per foot frontage, according to the kind of shop, has been given; and it affords very good and effective external lighting.

It was once felt that to adopt electric lighting, irrespective of cost, was to be progressive; but this is no longer the case. Many tradesmen have reverted to incandescent gas lighting, not merely because it is cheapest, but because it is most effective in getting really good illumination. That it is the cheapest is well known; and case after case has occurred where the money previously paid in electric lighting bills has been more than sufficient to reinstate gas fittings and lamps, pay the quarter's bill, and leave a balance in hand.

The effectiveness of gas illumination can be readily observed by anyone who chooses to look at a shop properly lighted by incandescent gas-burners. But there are other advantages. With most businesses it is advisable to keep the door open, ready for customers. In these cases the comfortable warmth resulting from the use of incandescent gas-burners is welcome both to the public and the assistants. In the days of the now almost obsolete flat-flame burners, the heat was probably too great; but with the incandescent gas lighting system this is very materially reduced—leaving, however, just sufficient to give a cosy feeling to the place. Further, this heat prevents materials from becoming damp, labels from losing their adhesiveness, and other similar troubles. On damp and foggy days, the advantage of gas lighting is undoubted. This is proved by the fact that even electric light users fall back upon otherwise disused gas-burners (where they have not been removed) for the purpose of dispelling the uncomfortable cold air.

The old arguments as to the hygienic advantages of electricity are of little account. Gas, as a matter of fact, is a considerable help to ventilation; keeping the air moving upwards, and thus renewing the supply. The use, too, of improved gas-lamps and inverted burners practically avoids any effect on ceilings and the like in ordinary places of business. The possibility also of easily switching lights on and off from one or more given points now applies to gas-fittings.

The public generally do not sufficiently realize the fact that where they have a gas supply they also have an expert and competent guide to good lighting results in the manager of the gas undertaking from whom they buy their gas. Nowadays all gas companies lay themselves out to afford advice and help to their customers gratuitously; and there need be no hesitation in accepting such free assistance. The gas officials are in a better position to advise, because the whole of their study and work is in gas matters, and their attention is not distracted by the vast variety of things dealt with by the ordinary ironmonger. Advice can thus be easily obtained as to adequate gas supply and pressure, reliable gas fittings and burners, how to instal them, and subsequently the best way of maintaining efficient results. Efficiency can be obtained by anyone, since incandescent gas-burners do not require skilled, but only simply common-sense, attention. It is a good plan to give the work of burner maintenance to one member of a staff. The cleaning of burners and the care of mantles do not take much time, and are quite as necessary as the ordinary dusting and sweeping of a shop. If any alteration or improvement in the lighting of a shop or other premises is contemplated, the proprietor, before doing anything, should consult the local gas manager.

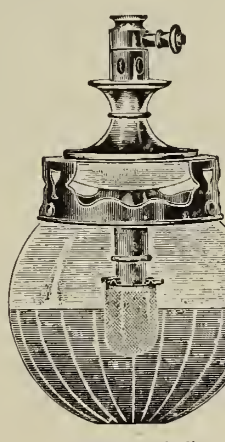
At a meeting of the Longton Town Council, sitting as the General Purposes Committee, on Monday of last week, it was decided, in response to an application, to increase by £50 per annum the salary of Mr. William Langford, the Gas and Electricity Engineer.

SOME NEW GAS-FITTINGS

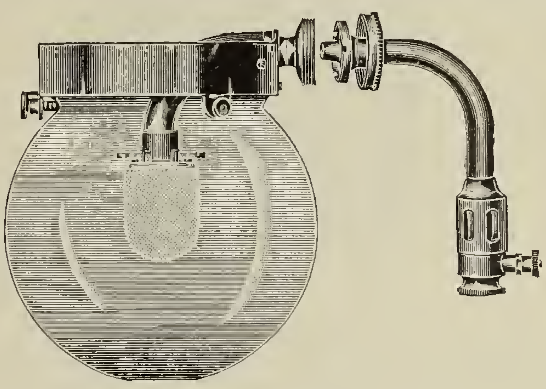
Of Messrs. Falk, Stadelmann, and Co.

We are now at the season of the year when those manufacturers who lay themselves out to meet the requirements of the suppliers and consumers of gas for the purposes of illumination are wont to introduce to public notice such fresh appliances as may have been devised by them for the benefit of their customers—and themselves. Perhaps the last two words are hardly necessary, for no one would expect a manufacturing firm to go to the trouble of placing upon the market any goods which they did not anticipate would be of benefit to themselves as well as to their customers; and, further, it is only in the natural order of things that what is of assistance to the buyer should also be the same to the seller. This, however, is a digression; and we must descend (or ascend) from the general to the particular.

A visit to the extensive show-rooms of Messrs. Falk, Stadelmann, and Co., in Farringdon Road, affords further proof of the demand that is anticipated for an intermediate size inverted burner. The firm are now making a "Vindex-Medium" burner—a new intermediate size between the large and bijou burners. It is strongly made in polished brass, steel or red bronzed, or oxidized copper, and has a china deflector. In outline and finish, it is like the large size "Vindex;" and it is specially suited for domestic lighting by reason of its small gas consumption—2¼ cubic feet of gas per hour, which is stated to give 55-candle power. The burner, which has a neat appearance, is fitted with a superior gas-regulator, having a thumbscrew of non-heating material, and an air-regulator. A new large size burner is the "Luna," which is similar in form to the firm's well-known "Vesta-Veritas," but of lighter and cheaper make. This has a china or enamelled casing, and is fitted with gas and air regulator; while it can be had with or without a bye-pass. It is claimed that with it a lighting power of 110 candles can be obtained for a consumption of less than 4 cubic feet of gas per hour. These burners, it may be remarked, are British made throughout.



The "Vindex-Medium" Burner.



"Veritas-Reversible" Swan-Neck Burner.

There are two other lines which Messrs. Falk, Stadelmann are introducing that may also be mentioned. The first is the "Veritas-Reversible" swan-neck burner, in strong polished brass. This is provided with a union joint, enabling it to be used in four different positions, so as to make it available for different types of brackets or pendants. The illustration shows it in use for adapting an inverted light to an upright fitting. The burner is said to give a light of 65 candles with a consumption of gas of about 3 cubic feet per hour; and it is provided with a gas and air regulator. Fitted to it is the other speciality of the firm to which attention has to be drawn. This is a new patent spring globe holder, the object of which is to facilitate the fitting of globes to, and their removal from, the burner, as well as to allow of the free expansion of the glass, and thus minimize risk of breakage. Spring pins are used instead of the ordinary screws; and these pins are fitted with tongues which, on turning the pins when they are drawn back, hold them in position at tension while the globe is being fitted. On turning again, when it is desired to fix the globe, the tongue passes through an aperture in the gallery provided for it, thus releasing the pin, which immediately springs into position for holding the globe. These holders can, of course, also be had fitted to other burners.

In addition to the lines here referred to, the firm have lately issued an incandescent gas lighting catalogue of a very complete kind, in which other new goods are illustrated and described. For instance, upright and inverted mantles, including the "Veritas Trilux" quality of inverted mantles and the "Merlin" self-shaping mantles, and also upright and inverted mantles and burners for petrol air gas. Among other things, many handsome designs in plain and fancy glassware are illustrated.

NEW GAS-FIRES FOR THE APPROACHING SEASON.

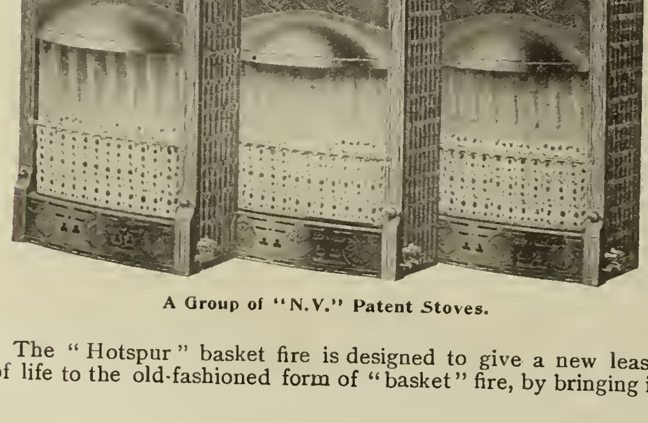
Messrs. John Wright and Co.'s Novelties.

We are again reminded that autumn is with us by an early intimation from Messrs. John Wright and Co. of their preparations for the forthcoming gas-stove season. It is claimed by the firm that their new appliances embody further fresh developments in gas-heating, particularly in an increase of radiant efficiency. An innovation which cannot fail to be of great interest, and which was foreshadowed last year in the firm's patent "N.V.," is the large increase of fire width introduced in their latest pattern fires. This is a matter to which Messrs. Wright attach very great importance. They hold that one thing which has hitherto retarded the more general adoption of heating by gas has been the fact that when a coal fire of (say) 16 to 20 inches has had to be replaced by a gas-stove, the best that could be done was to put in a gas-fire some 10 inches in width at the most. As a result, the new appliance not only looked disappointingly small, after its much wider predecessor, but actually afforded so much less radiating surface that, in spite of its many advantages, it often did not adequately heat the room in really cold weather.

The introduction of this new wide-fire principle makes available in the gas-fire as great an amount of radiating surface as in the coal-fire which it replaces. Some two or three years ago, such a departure as the principle referred to involves would not have been possible. Messrs. Wright point out that it is their successive inventions—the "Simplex" shallow fire, and later on the patent "Thermo" fire-front—which, by rendering every heat unit of the gas consumed directly effective as radiant heat, have made the gas-fire so much more economical as to bring the construction of a stove of so great a width as 20 inches within the sphere of practical attainment. With the old deep type of gas-fire, the cost of gas for a stove with such a fire-width would have been quite prohibitive; but with the economies effected by the "Simplex" and the "Thermo" principles, it is claimed that Messrs. Wright's new "Salon" gas-fire, which embodies this new wide-fire principle, has an astonishingly low gas consumption, notwithstanding its unprecedented width and its proportional increase

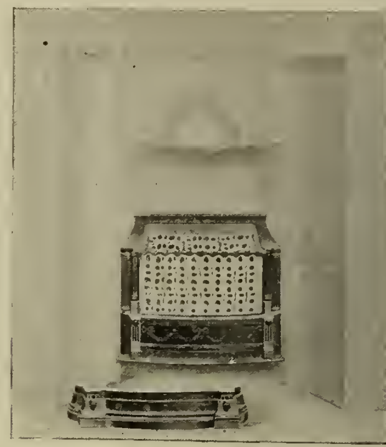
The "Salon" Gas-Fire.

in radiant efficiency. The "Salon" gas-fire, it will thus be seen, is an entirely new type of stove. It is made in two sizes, with fire-widths 17 and 21 inches respectively, which it is submitted provides an amount of radiating surface beyond anything hitherto attempted. Messrs. Wright's experience with last year's patent "N.V." stove, 36 inches high, has so far confirmed their anticipations of the welcome which would be accorded to it, that they have this year produced a series of these fires by adding two new heights, 31 and 34 inches respectively; and as each fire can be had with wings open at the back 20, 22, 24, and 28 inches, this actually forms a range of twelve separate fires.



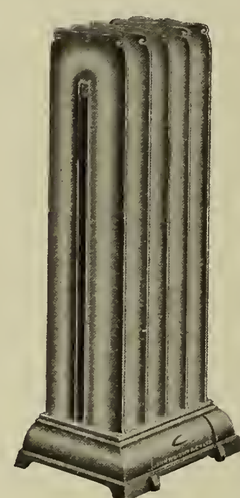
A Group of "N.V." Patent Stoves.

The "Hotspur" basket fire is designed to give a new lease of life to the old-fashioned form of "basket" fire, by bringing it



The Patent "Hotspur" Basket-Fire in Coal Grate.
(Showing the patent adjustable grate-front separate from the stove.)

into line with modern gas-fire science. A feature of much importance is its patent adjustable grate-front, which hides the ash pan opening of the coal-grate, and can be fixed by a couple of screw-knobs at any height from $3\frac{1}{2}$ to $5\frac{1}{2}$ inches, so as to make a continuous grate-front with the ordinary fender of the basket-fire itself. It is claimed that the effect is so far in advance of the ordinary pattern that the "Hotspur" may with confidence be expected to create a considerable demand for this type of fire. It is made in four sizes, with "Thermo" fire-front in four widths—8, 10, 12, and 14 inches respectively.

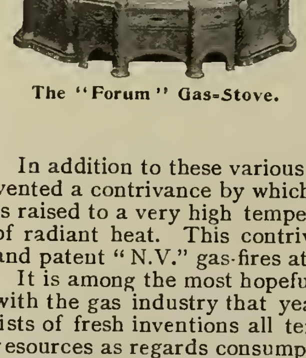


The "Official" Flue Radiator.

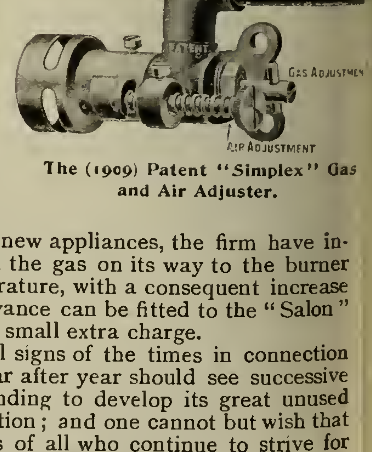
Another apparatus on which Messrs. Wright lay much stress, and for which they are hoping great things, is the "Official" flue radiator, specially designed for use in ill-ventilated or closely-crowded workshops, offices, &c., where it would be inadvisable to instal a flueless gas-radiator. It may therefore be regarded as the natural complement of the firm's "St. Andrew;" and as the principle of the new radiator has been well tried for many years in their "St. Patrick" with flue, Messrs. Wright speak very confidently of the position which they believe the "Official" is bound to make for itself, in greatly widening the limits within which gas radiators may be effectively employed.

A further improvement is embodied in their new (1909) patent "Simplex" gas-and-air adjuster, which provides for perfectly graduated adjustment all the way between the minimum and maximum limits, while securing equally unimpeded pressure at all points. As there are no screw-threads employed, in adjusting the gas, there can be no possibility of leakage.

Messrs. Wright have added to their already large selection of nursery fires yet another—the "Forum"—which is noteworthy for its beauty of design and its very moderate price.



The "Forum" Gas-Stove.



The (1909) Patent "Simplex" Gas and Air Adjuster.

In addition to these various new appliances, the firm have invented a contrivance by which the gas on its way to the burner is raised to a very high temperature, with a consequent increase of radiant heat. This contrivance can be fitted to the "Salon" and patent "N.V." gas-fires at small extra charge.

It is among the most hopeful signs of the times in connection with the gas industry that year after year should see successive lists of fresh inventions all tending to develop its great unused resources as regards consumption; and one cannot but wish that success may attend the efforts of all who continue to strive for the perfection of the gas-stove on scientific lines.

STANFORD-LE-HOPE GAS-WORKS.

Opening Ceremony.

A View of the New Gas-Works.

Reference was made in the "Journal" some weeks ago to a moderately capitalized undertaking entitled the Stanford-le-Hope Gas Company, Limited, which had been formed for the purpose of erecting works at the place named; and it was remarked that this was "quoted as an example of an honest gas investment, as distinguished from company promoters' over-capitalized concerns." We stated that the Directors were men bearing such well-known names as Mr. W. A. Surridge (Chairman), Mr. James Cloudsley, J.P., and Mr. Frederick R. Smith; while the Secretary was Mr. William Cash, F.C.A., and the Board were being advised, in the capacity of Consulting Engineers, by Messrs. Corbet Woodall and Son. The Company have a Provisional Order dated 1905; but nothing was done with it until last year, when a start was made with the erection of the works, which were formally opened last Wednesday, when the supply of gas to the district commenced. The statutory powers include the supply of gas in the parishes of Mucking, Orsett, Horndon, Stanford, Corringham, Fobbing, and Langdon Hills, in the county of Essex. The oil street-lamps of Stanford-le-Hope have been usually lit on Sept. 1, following a summer vacation; and the new Gas Company, having contracted with the Parish Council, were able to celebrate their opening by lighting 80 of these with incandescent gas—Bray's upright burners being utilized for the purpose. The district is first and foremost an agricultural one; but it has a growing residential population, and there are some factories in the neighbourhood. Its frontage on the River Thames, too, should be a point in its favour. In addition to the street-lamps, the Company start with about 100 consumers.

The works, which stand on about ¾ of an acre of ground, have been designed for an output of 5 million cubic feet a year, though this consumption is not anticipated just at first. It is, however, thought that half this quantity will be required at the outset. The site borders on the railway, which will facilitate the delivery of coal; and later on, if thought desirable, it will be easy to run a siding into the retort-house. The works have been substantially and well built of brick by Mr. J. Dobson, a local Contractor. The first range of buildings comprises the office, stores and workshop, and station-governor room. Then comes the retort-house (covering a space of about 30 feet by 36 feet), adjoining which is the exhauster-house. After the purifiers are the oxide-shed and the station-meter house; and at the end of the site is the holder.

There are two retort-benches, one with one and the other with two retorts, fired on the regenerative principle, by Messrs. Gibbons Bros.; and at the side is a Dillamore tar-column. There is plenty of room for extensions when required, both in this and in other parts of the works. After leaving the retorts, the gas passes round the inside of the house, and through a set of tubular condensers. The exhauster, gas-engine, and pump are by the Bryan Donkin Company; and there is a Livesey washer, by Messrs. Bailey, Pegg, and Co. The purification will be by oxide of iron. The station-meter (of 1200 cubic feet per hour capacity) and the governor are by Messrs. Parkinson and W. & B. Cowan. It is proposed to supply the gas at about 2½ inches pressure; and the initial price will be 4s. 6d. per 1000 cubic feet. The gasholder, constructed by Messrs. S. Cutler and Sons, of Millwall, to the designs of the Engineers, is in two lifts, and has a delivering capacity of 14,500 cubic feet. It is contained in a steel tank 32 feet in diameter by 12 ft. 4 in. deep, and is spirally guided by five rail guides and carriages to each lift, constructed in accordance with Messrs. Cutler's patents. The tank has a capacity of 60,000 gallons of water, or 268 tons. The dimensions of the two lifts are as follows: Outer lift, 30 feet diameter, and 12 feet deep; inner lift, 28 feet diameter, and 12 feet deep.

The most interesting feature of the undertaking is the exclusive use of Mannesmann steel tubes for distribution. There are at present about 5 miles of mains, ranging from 6-inch to 2-inch, with the "rigid" type of joint, and caulked with lead wool. The

Testing with Pump and Mercury Gauge.

Group of Specials, with Rigid Joints.

A Straight Run of Mannesmann Tubes.

Five-Inch Curved Main, Sprung into Trench by Leverage and Wedges.

experience of the Engineers is that these steel mains are quicker to lay, cheaper, and in every way more convenient than cast iron; and with them there is nothing to fear from steam-roller or motor traffic. All services, whether to houses or lamps, are connected by the Woodall-Parkinson expansion-nipple. With steel mains, it has been found possible to go back to 2 inches diameter for many of the bye-streets—that being a size which has of late years been abandoned in cast iron. No services are less than $\frac{3}{4}$-inch; but as it is a little difficult to tap a $\frac{3}{4}$-inch hole quite true in a 2-inch main, the $\frac{1}{2}$-inch expansion-nipple is used for this size, coupled to an enlarging socket. It may be added that all services-pipes also are of Mannesmann steel tube. A series of photographs has been taken of this modern system of mainlaying as exemplified at Stanford, a few of which are reproduced.

One of the photographs is of a group of specials, and indicates what can be made in steel tubes. In another it will be noticed that the main is curved. In this case, the joints are made first on top of the trench; and then the main is curved and pressed down into the trench. The joints being of the "rigid" type are not affected by the bending. Yet another photograph illustrates the testing. There is a test of about 5 lbs. pressure applied to all the mains as laid.

All the main and service laying has been superintended by the new Manager, Mr. P. W. Dillamore, a son of Mr. John Dillamore, whose name is so well known in connection with the Dillamore tar-column.

At mid-day, a party of some twenty-five gentlemen assembled in the office on the works, for the purpose of inaugurating the supply of gas. Those present included Mr. William A. Surridge (the Chairman of the Company), Mr. James Cloudsley, J.P., and Mr. Frederick R. Smith (Directors), Mr. Ambrose Ellis (the Chairman of the Parish Council), Mr. A. W. Kerly, J.P.; Mr. W. Levitt (the Chairman of the Lighting Committee), Mr. James Randall, Mr. John Dillamore, Mr. Henry Woodall (Messrs. Corbet Woodall and Son), Mr. Samuel Cutler, jun., Mr. J. Dobson, Mr. P. W. Dillamore (the Works Manager), and Mr. W. Wilkinson (representing Mr. Cash, the Secretary).

Mr. Surridge, on behalf of the Gas Company, expressed pleasure at meeting those residents who were present, and then asked the Chairman of the Council to light the first gas-burner, which was fitted in the centre of the room.

The gas was then lighted by Mr. Ellis by the aid of a match taken from a box which Mr. Surridge subsequently asked him to accept as a memento of the occasion.

Mr. Surridge, addressing the company, remarked that the works had been constructed for an output of something like 5 million cubic feet per annum. The Company was incorporated in 1898; but, he supposed for want of local support, no steps were taken to erect works. In 1905, a Provisional Order was secured; but even then no progress was made until the present Directors and their friends last year took over the undertaking. They felt that some credit was due to themselves for the fact that, within twelve months of having the matter in hand, the works had been completed, and in a position to start the supply of gas to the district. There was one special feature in connection with the installation—namely, that the mains were of steel throughout. In this, they had followed the advice of Messrs. Corbet Woodall and Son; and they felt that they had done right. The Company had at present about 100 consumers and 80 public lamps. Their powers extended over a very considerable district. It was only fitting that he should acknowledge their great indebtedness to Messrs. Woodall and Son for the manner in which they had designed and carried out the works, and also to the different Contractors for the excellent way in which everything had been done. They had also to thank Mr. B. R. Parkinson (of Messrs. Woodall and Son) for the trouble he had taken, especially in connection with the laying of the steel mains. It was matter for congratulation that Mr. P. W. Dillamore, who had been in charge of the work from the beginning, was now Manager. The experience he had already gained would be greatly helpful to him in this capacity.

An inspection of the works was then undertaken, during which the process of gas manufacture was briefly explained to those who were not familiar with it; and then there was an adjournment to the Railway Hotel, where, on the invitation of the Chairman and Directors of the Company, the party enjoyed an excellent lunch, which was followed by a few short speeches.

Mr. Surridge presided; and after the Loyal Toast had been duly honoured, he proposed "The Progress and Prosperity of Stanford-le-Hope." He remarked that when he first visited the place to discuss the prospects of the gas-works, he was much struck by the fact that it had a very attractive appearance and bore many of the outward marks of prosperity. One of these marks, however, it lacked. It was true that there were public lamps; but they were lighted by oil. This the Company had set themselves the task of remedying; but they must look to the inhabitants to support them in the undertaking. There were important interests in the district; and with the growing tendency to move docks, wharves, and factories nearer and nearer to the mouth of the river, there should be in store developments which might add materially to the prosperity of Stanford—to say nothing of the fact that the district was one which seemed to be becoming increasingly residential.

Mr. Ellis, in response, said the inhabitants of Stanford regarded this as a "red-letter day;" and he himself certainly felt that the lighting by gas would be a step in the right direction, and would help to make the place go ahead.

Mr. Randall next proposed "Prosperity to the Stanford-le-Hope Gas Company." He said he felt that, small as the undertaking now was, it had good prospects. After drawing attention to the advantages of the prepayment meter, the incandescent burner, the cooker, and the heating stove, he remarked that the Directors of the Company were men of strict probity, who would do everything thoroughly and would meet every reasonable requirement in the way of main extensions. As to the Manager and the workmen, they were indebted to them for the part they had taken; and he coupled with his toast the names of the Chairman and Directors and the staff generally.

Mr. Surridge, on behalf of his colleagues and himself, thanked Mr. Randall for his remarks. They believed, he added, that they had embarked on an enterprise which would prove a success. At all events, they would do their best to make it so. If they had a regret, it was perhaps that so few of the local people had so far cared to take an interest in the concern. This, however, was not an unusual experience by any means in the early history of gas-works. Possibly in the present case this abstention was partly owing to the fact that there was not very far away a conspicuous failure in gas enterprise; but this was conceived, as he was sure they knew, on widely different lines from those on which the Stanford undertaking had been started. He hoped, therefore, that when the days of prosperity came to the Company, the residents would remember that the Directors had held open the door to them on exactly the same terms as they had subscribed capital themselves; and when the shareholders were securing, as he hoped they would, a good return on their investment, the inhabitants must not grudge them the reward of their enterprise.

Mr. Cloudsley remarked that for the equipment of the undertaking they had so much admired, they were much indebted to Messrs. Corbet Woodall and Son, whose guidance they were glad to have had. There was present a partner in the firm—Mr. Henry Woodall—who had taken great interest in this little concern. He had therefore pleasure in proposing "The Consulting Engineers," because they had done much to bring the undertaking to successful completion.

Mr. Henry Woodall, in acknowledgment, said it had been a great pleasure to him and to his firm to be associated with the works. It was a little undertaking now; but they hoped it would be a big one some day. Of course, engineers, however well they designed and did their work, were much dependent upon the people who carried it out; and in this respect his firm had been highly fortunate. Mr. Dobson and Mr. Cutler had done their work very well; and the Company had an excellent Manager in Mr. Dillamore. They could well congratulate themselves that the man who was to take charge of the works had had

the task of looking after the erection of them. Mr. Dillamore had taken the greatest possible interest in his work, and had displayed much energy and enthusiasm. His firm was most satisfied with the works and with the mains. They had tested the latter, and found they were practically sound; and one thing they would avoid was the serious leakage encountered where mains were not well laid. He hoped the works would increase, and that Mr. Dillamore would remain as Manager until he had some day charge of a large undertaking. He would also like to thank Mr. Parkinson, who had greatly assisted the work, and who was an authority on mainlaying. The Chairman had mentioned that the unique feature about the works was that all the mains were steel. In these days of heavy traction and much vibration, he thought steel mains would be a great help; and so he was glad to be connected with a Company that was the first to adopt the principle of using steel mains wherever possible.

Mr. Kerly remarked that for some years he was Chairman of the Parish Council; and during that time the question of lighting came up. Some of them thought the time had arrived to start a company, and one was registered, without any idea of obtaining a Provisional Order. They were advised that a gas-works could be started for a very moderate sum; and £3000 was subscribed. Then some one came into the village and said that gas was quite behind the times, and the place ought to be lighted by electricity. If the gentleman who offered them electricity could have done all he said he could do, there was no doubt they were mistaken in deciding to light by gas. A parish meeting decided in favour of adopting the electrical scheme; but it came to nothing, and they were again faced with the question of what they should do. They had returned the money subscribed for the Gas Company; and so the Parish Council decided on oil-lamps. Later on, as they knew, the Gas Provisional Order was applied for. This was the history of the whole matter. He had had many offers from companies of very doubtful capacity to take the thing over; but he was pleased to say he always resisted them. He and those connected with them felt that they would rather let the thing drop, than for it to get into the wrong hands. Now they had associated with the enterprise gentlemen who intended to make the business a success. Stanford was to be congratulated on having such works; and he trusted the Company would be rewarded by receiving maximum dividends on the money they had expended. They deserved no less. Even if for the moment the cost of gas should be a little more than that of oil, they ought to disregard this. He did not, however, agree that it was so, because he believed that the extra convenience, saving of labour, cleanliness, &c., made up for any slight extra cost. Anyway, they should not make their calculations too closely, but should give their favour to the gas people, who had done so important a thing in the interests of Stanford.

Mr. Levitt, speaking as Chairman of the Lighting Committee, said they recommended gas for the streets because they felt convinced that they would be excused if they did for the first year or two possibly exceed the sum of money which it was their custom to spend on public lighting. They felt sure that in the end they would be justified. He wished the Company every success, and trusted the inhabitants of the surrounding villages would take up gas, so that in the near future the shareholders might receive a good return on their outlay.

REGULATED AIR-BLAST FOR BREEZE FIRING.

Herr B. Knüpfer, Gas Superintendent at Belgard, described in a recent number of the "Journal für Gasbeleuchtung" a new type of air-blast for boiler furnaces, in which coke breeze is used, of which he has had experience. It is made by the firm of Müller and Korte, of Pankow, near Berlin. There is a positive pressure under the grate, which is of the usual injecting grate-bar type; the width of the air-spaces being regulated according to the working conditions. The peculiarity of the new arrangement which distinguishes it from older types is that the air is injected beneath the grate by a steam injector, provided with a regulating arrangement through which the steam introduced is subjected to special compression, so that a smaller quantity suffices to force the requisite amount of air under the grate and to produce the necessary pressure. This regulating arrangement is quite independent of the valve operated by the stoker. The steam consumed, according to Herr Knüpfer's observations, amounted to only about 6 per cent. of that produced, and the evaporation was about 5·23 times the weight of breeze employed. Taking the calorific value of the breeze at 9360 B.Th.U. per pound, and the temperature of the feed water at 64° Fahr., the efficiency of the boiler was 64·3 per cent., and the amount of steam produced per square foot of heating surface per hour was 5 lbs. This is a better result than is frequently obtained, even with coal firing; and, having regard to the fact that the coke breeze has such a comparatively low calorific value, the cost of steam for producing the requisite air pressure under the grate is regarded by Herr Knüpfer as particularly satisfactory in comparison with the output of the boiler.

We have received from the Principal of the Municipal School of Technology, Manchester, the calendar for the session 1909-10. It is a bulky volume, on pp. 397-401 of which will be found particulars of the classes in "Gas Engineering and Supply" and "Technical Gas Analysis." The Chemistry Section is conducted by Mr. W. Buckley (Ordinary Grade) and Mr. F. S. Sinnatt. "Technical Research and the Construction of Plant" are subjects which are in the hands of Dr. Grossmann. The course in "Coal-Tar Products" is conducted by Professor E. Knecht. The price of the calendar is 6d., or 10d. by post.

GASEOUS EXPLOSIONS.

Second Report of the British Association Committee.

At the Meeting of the British Association in Winnipeg which closed last Wednesday, the Committee appointed for the investigation of gaseous explosions, with special reference to temperature, presented their second report. The members of the Committee are Sir W. H. Preece (Chairman), Mr. Dugald Clerk and Professor Bertram Hopkinson (Joint Secretaries), Professors Bone, Burstall, Callendar, Coker, Dalby, and Dixon, Drs. Glazebrook and Hele-Shaw, Professors Petavel, Smithells, and Watson, Dr. Harker, Lieut.-Col. Holden, and Captain Sankey. Their first report was given in the "Journal" this time last year (Vol. CIII., pp. 719, 793). In due course the second report will appear in our pages; but meanwhile it will be of advantage to publish the following paper submitted to the Engineering Section of the Association by

MR. DUGALD CLERK ON THE WORK OF THE COMMITTEE.

Both the steam-engine and the internal-combustion motor had attained great practical utility, and reached a comparatively advanced stage of development, before much knowledge was available of the properties of the working fluids employed. Continued progress, however, requires very complete knowledge—in the one case of the properties of steam, and in the other case of the physical and chemical properties of a gaseous explosion and the combustion products resulting therefrom.

Though it is now 135 years since the date of James Watt's success at Soho, near Birmingham, knowledge of the properties of steam as a working fluid is by no means complete. Accordingly, it is not surprising that during the shorter history of the practical period of the internal-combustion motor, physicists, engineers, and chemists have so far failed to obtain a complete knowledge of the properties of gaseous explosions and the products of such explosions at high temperatures.

The internal-combustion motor has reached the stage when further development in many directions depends upon an intimate knowledge of the properties of the working fluid and of the phenomena of heating that fluid by combustion. The object of the Gaseous Explosions Committee of the British Association is to combine the work of physicists, chemists, and engineers, in order to determine with accuracy the phenomena and physical constants involved in the operation of the working fluid within the cylinder of the internal-combustion motor. As befits a Committee of the British Association, most of the work is of a purely abstract nature, which might be appropriately conducted by either the Physical or the Chemical Section.

As the direct practical application may not be clear to some engineers, Sir William H. White, our distinguished President, has asked me to write this note, pointing out the practical application of the knowledge acquired by investigation to the urgent present problems of the internal-combustion motor. Accordingly, I propose to deal shortly with some points of engineering importance which require further knowledge of physical and chemical phenomena before they can be accurately dealt with, and I begin with the important question of

Thermal Efficiency and its Limits.

A very large part of the work of the gas-engine inventor and designer has been devoted to improving the thermal efficiency of the engine, with the result that it has risen from 16 to 37 per cent. in twenty-six years. The following table shows this very clearly.

Indicated and Brake Thermal Efficiency of Four-Cycle Engines from 1882 to 1908

No.	Mechanical Efficiency.	Names of Experimenter.	Year.	Dimensions of Engine.	Indicated Thermal Efficiency.	Brake Thermal Efficiency.	Type of Engine.
	Per Cent.			Diameter in. Stroke in.	Per Cent.	Per Cent.	
1	87·6	Slaby . . .	1882	6·75 × 13·70	16 0	14·0	Deutz.
2	84·2	Thurston . .	1884	8·50 × 14·00	17·0	14·3	Crossley.
3	86·1	Society of Arts	1888	9·50 × 18·00	22·0	18·9	Crossley.
4	80·9	Society of Arts	1888	9 02 × 14·00	21·0	17·0	Griffin (6-cycle).
5	87·3	Kennedy . .	1888	7·50 × 15·00	21·0	18·3	Beck (6-cycle).
6	82·0	Capper . .	1892	8·50 × 18·00	22·8	17·4	Crossley.
7	87·0	Robinson . .	1898	10·00 × 18·00	28·7	25·0	National.
8	83·0	Humphrey .	1900	26·00 × 36·00	31·0	25·7	Crossley.
9	81·7	Witz . . .	1900	51·20 × 55·13	28·0	22·9	Cockerill.
10	85·5	Inst. of Civil Engineers .	1905	14·00 × 22·00	35·0*	29·9	National.
11	77·1	Burstall . .	1907	16·00 × 24·00	41·5†	32·0	Premier.
12	87·5	Hopkinson .	1908	11·50 × 21·00	36·8	32·2	Crossley.

* The value—35 per cent.—is deduced by the author from the Institution of Civil Engineers' Committee's values.

† This value is, in the author's view, too high; probably due to indicator error.

Indicated and brake thermal efficiencies are given in the table, together with mechanical efficiency. These indicated thermal efficiencies give the proportion of the total heat of combustion of the fuel supplied, which is converted into indicated work acting on the motor piston. These greatly improved results have been attained,

broadly, by following the definite theory that thermal efficiency is increased by diminishing the volume of the combustion space relative to the volume swept by the piston. The question now arises: Can we greatly improve thermal efficiency by further developments in the same direction? This question can only be answered when we attain a minute knowledge of the properties of our working fluid. The guide hitherto adopted by engineers has been what is known as the air standard. This assumes an engine to go through all its operations of charging, compressing, adding heat, expanding, doing work, and exhausting, with pure air as its working fluid; and the air so used is assumed to have certain definite physical properties and a constant specific heat. On these assumptions, it is possible to calculate indicated thermal efficiencies for any given proportions of engine and compression space where loss of heat is assumed to be absent.

Comparing efficiencies so calculated with those actually attained, it has been sought to obtain some idea of the relative performances of different engines compared with a standard. It has long been known, however, that though the air standard is exceedingly useful for comparative purposes, yet it does not supply an absolute measure. If we take, for example, the indicated thermal efficiency of an ordinary four-cycle gas-engine (say) as 35 per cent., and compare this with the ideal efficiency for the same engine using air as the working fluid without heat loss, we find that the real engine converts only 70 per cent. of what would be converted by the ideal engine. If air had the same properties as the real working fluid, this would mean that 30 per cent. improvement was still possible, if we could build an engine suppressing all heat losses. From some calculations made by me about two years back, on the known properties of gaseous explosions, I was able to prove that the actual working fluid of the engine, even if so used as to suffer no heat loss whatever, could not be so efficient as air. With the actual working fluid, I found that such an engine as above indicated was really converting 88 per cent. of all the heat which it could possibly have converted into work, having regard to the properties of the mixture of nitrogen, oxygen, steam, and carbonic acid forming it. These calculations rested upon determinations of the properties of gaseous explosions made by Mallard and Le Chatelier, Langen, Holborn and Henning, and Clerk, which differed from each other to some extent. If the adopted numbers be true, then by suppressing all heat losses in a modern internal-combustion motor cylinder we could only increase the thermal efficiency from 35 to nearly 40 per cent. It is, of course, impossible to suppress all heat losses; accordingly, it would appear that the margin available for future improvement in thermal efficiency is small.

These calculations as to possible efficiency depend upon an accurate knowledge of the total energy of a mass of hot gas within a cylinder under different conditions, and necessitate an accurate knowledge of temperature and apparent specific heat of the gases dealt with. This knowledge it is the object of the British Association Gaseous Explosions Committee to supply. Accordingly, experiments have been arranged in conjunction with the various investigators forming the Committee to enable correct determinations to be made, and to eliminate satisfactorily the errors at present known to exist. When the values of temperature and apparent specific heat are correctly determined, then and then only will it be possible to define with accuracy the limits of efficiency proper to any cycle of operations. The difficulties of the task will be apparent to the engineer who peruses the two reports of the Committee. He will find that all methods of determining the apparent or real specific heat of gases at high temperatures are open to criticism. The latest determination up to temperatures such as 1200° C. are those of Holborn and Henning, of Berlin, and Clerk, of London. The German experiments were made by means of a thermopile and calorimeter in a manner very similar to Regnault's earlier work on nitrogen, air, and carbonic acid at lower temperatures; and Clerk's experiments were made in the cylinder of a 60 H.P. gas-engine by a new method—that of alternate compression and expansion. Clerk's values are throughout about 10 per cent. higher than Holborn and Henning's.

In discussing the possible error of both methods of experimenting, Professor Callendar points out that the corrections necessarily introduced by Regnault's method lead to a result which may be as much as 3 per cent. too low, even when working at a temperature no higher than 100° C. He further points out that Holborn and Henning, working at higher temperatures, such as 1200° C., may increase this error to 10 per cent. Professor Hopkinson, on the other hand, suggests that Clerk's experiments may be subject to a systematic error due to unequal division of heat loss between the compression and expansion stages; and he considers that this possibly unequal division may cause an error in Clerk's values of about 7 per cent. excess. Callendar thus considers that Holborn and Henning's results may be too low; while Hopkinson leans to the view that Clerk's results are too high.

The second report of the Committee carries discussion a stage further. Swann's elaborate experiments by means of Callendar's method prove that Regnault was about 2 per cent. too low in his specific heat value for air; and further experiments by Clerk on the specific heat of dry air by his method of compression and expansion show values 3 per cent. higher than Swann's, and prove that under the conditions of a particular set of his experiments the heat-loss division between compression and expansion lines is not correctly given by the proportion between the two mean temperatures. Hopkinson is therefore justified in calling attention to this possible source of error.

Later experiments made by Clerk, calculated since the second report was settled by the Committee, supply some proof that more effective cooling of the engine cylinder, by a rapid flow of water through the jacket, restores the proportionality between the heat loss on compression and expansion lines; and specific heat determinations made on the same engine show the value for air obtained by Clerk's method to be within 1 per cent. of Swann's value for the same temperature. It is therefore probable that Clerk's method is reasonably free from systematic error at high temperatures, such as 1000° C. It is hoped that new values so determined will be available for next year's report. The rivalry of the different methods is most interesting to the Committee; and it is felt that, by continued experiment and discussion, close approximations to true values will ultimately be obtained.

The question of temperature is also vital to the work of the Committee; and its correct determination involves subsidiary, but difficult, investigations on the questions of chemical equilibrium, dissociation, and thermal distribution, which are being dealt with by chemists (Professors Bone, Dixon, and Smithells), by physicists Drs. Glazebrook and Harker and Professor Watson), and by engineers (Professor Dalby and the present writer). Some progress has been made in the two years of work, especially in the application of accurate optical indicators; and it is hoped that further information will be available within another year.

Even with our present knowledge, however, it is becoming increasingly evident that certain limits are close upon us, and that further increases in indicated thermal efficiency will be possible only by considerable alterations in the actual thermal cycle used, and that little further development is possible on the old lines of increasing compression. To decide, however, which is the direction of advance, it is necessary to know very accurately both temperature and specific heat, as I have indicated.

Maximum temperatures of 1700° C. are usual in economical internal-combustion motors; and a perfect heat-engine taking in all its heat at that temperature, and discharging only that necessary on the Carnot cycle at 17° C., would give a thermal efficiency of 85 per cent. The highest actual efficiency obtained so far is about 37 per cent.; and this is about 87 per cent. of what its perfect cycle would allow. This is obviously far short of the Carnot cycle efficiency; and it appears possible that actual efficiencies as high as 50 per cent. may be obtained by modifying the existing cycle so as to attain greatly increased expansions by compounding and condensing. The use of the regenerator may even become possible in large engines operating on changed cycles.

Problems Depending on Knowledge of Heat Flow.

Although further improvement in thermal efficiency is of high scientific interest, for the present the efficiencies already attained are sufficiently good. Indeed, they may be considered as having overrun the existing stage of development of the large gas-engine considered as a mechanism; that is, large engines require attention more on the mechanical than on the thermodynamic side. The work of the Committee is of the utmost importance in this connection.

Commercial gas-engines are usually designed to take safely a regular maximum pressure of 400 lbs. per square inch; but in the event of pre-ignition they may have to stand 500 lbs., or even more. In an engine so designed, the working mean pressure will not usually exceed 80 lbs. per square inch. The maximum pressure in the engine cylinder is usually about five times the mean pressure. In engines of moderate dimensions, giving (say) up to 200 I.H.P. per single-acting cylinder, it is not very difficult to comply with all the mechanical conditions necessary for safety and continuous working under heavy loads. The case is very different, however, in gas-engines of really large dimensions. The largest power at present claimed as produced in a single double-acting four-cycle cylinder is about 1200 H.P., and the cylinder is about 45 inches diameter and 51-inch stroke and the revolutions 94 per minute. To construct an engine with so large a cylinder, and get it to operate with freedom from breakdown, taxes to the utmost the resources of the skilled designer and constructor. Great credit is due to those persevering Continental, English, and American gas-engine designers who have devoted so much time, skill, and money to overcoming the difficulties of these large constructions. Though a certain measure of success has been attained, it is success with important limitations. I cannot help feeling that, before any permanent financially successful development of the large-cylinder gas-engine can be hoped for—such a development, for example, as would permit an engine of 10,000 H.P. to be applied for marine purposes—it will be necessary to do more than skilfully meet the various difficulties in a mechanical way. It will be necessary, in fact, to re-design the thermodynamic cycle of the large gas-engine in order to obtain a closer approximation to the easier mechanical conditions of the large steam-engine.

The conditions of the steam-engine are very much less onerous than those of the gas-engine. In the matter of mean pressures, for example, no marine steam-engine exists where the ratio of maximum to mean pressure in any one cylinder is so high as 5 : 1. The temperature conditions, too, of the steam-engine are much more gentle. It is quite possible to re-design the gas-engine cycle in such a way that maximum pressures do not exceed (say) 150 lbs. per square inch, while mean pressures of 70 lbs. per square inch are obtained. It is also possible to diminish the flame temperature used within the cylinder to such an extent as to greatly reduce the heat flow through the cylinder walls. To do this,

however, and produce (say) a 10,000 H.P. marine gas-engine, it is necessary to know with considerable accuracy the rate of heat flow from hot gases at certain temperatures—say, between 2000° C. and 800° C.—that is, the rate of heat flow from those gases to the enclosing cylinder walls. It is also necessary to know how this flow is affected by variations in the density of the gas. Further, it is necessary in designing such large engines to discover some method of entirely suppressing pre-ignitions. Consider the position of a marine-engine designer designing a large marine steam-engine (say) if he be told that his ordinary maximum pressure, as supplied by the steam-boiler, is 150 lbs. per square inch, but that he must so design his engine that if 300 lbs., or even 400 lbs., per square inch perchance comes upon it, it must not break down under that added stress. It would be hardly possible to design a large steam-engine with such a condition overhanging him.

Part of the work of the Committee consists in determining the conditions of heat flow to the cylinder walls, and the amount of the heat flow under certain conditions at various densities and temperatures. Given this knowledge, it will become possible to design engine cycles whose mechanical conditions are much less rigorous than those existing in the large gas-engine of to-day. Such a cycle must have low maximum pressure, relatively high mean pressure, low mean temperature, and as low density of working fluid as is compatible with economy at certain portions of the thermodynamic cycle. The conditions of heat flow are being carefully studied by four members of the Committee—Clerk, Coker, Dalby, and Hopkinson. So far only approximate values are known; but continued investigation will undoubtedly enable sufficient accuracy to be attained.

To enable high-temperature determinations to be made, it was found necessary to reconsider much of the low-temperature work; and even Regnault's determinations of, for example, the specific heat of air, were found, as has been shown, to be erroneous to the extent of 2 per cent. Now, 2 per cent. error at low temperature is not of any great moment from the engineering point of view; but it introduces much larger errors when high temperatures are studied, so that even the low-temperature work must be revised. The Committee are fortunate in having the co-operation of Professors Callendar and Watson in the consideration of this work; and Professor Glazebrook and Dr. Harker are giving valuable aid at the high-temperature end. Other physical problems arise which require consideration. The problem of radiation from a gaseous explosion, for example, is one which has a considerable bearing upon the mechanical conditions at the high-temperature end of the thermodynamic cycle. Other physical problems are being dealt with, such as the heat distribution throughout the walls of the combustion space, the valves, and the piston end. Professor Hopkinson has done valuable work in this connection. The conditions of chemical equilibrium within a gaseous explosion are also of moment from the practical point of view; and Professors Bone, Dixon, and Smithells are rendering valuable aid, in co-operation with the physicists, to determine what really goes on at the explosion end of the engine cycle.

Existing large gas-engines are disproportionately heavy and bulky for the power developed by them; and increase of power with reduction of weight can only be attained by compromise between conflicting conditions. The gas-engine designer cannot even consider the points of difference without minute knowledge of the conditions of heat flow to the walls and heat distribution in them. This knowledge the Committee hope to acquire, both for the benefit of abstract science and the applied science of the engineer.

Another Presentation to Mr. John Bond.

The presentation to Mr. John Bond, the Gas Engineer of the Southport Corporation, by the officials and workmen at Crowlands, on the occasion of his marriage, to which reference was made in the "Journal" last week, took place on the 30th ult. There was a large gathering, presided over by Mr. C. H. Kenyon, the Chief Clerk of the Gas Department, who asked Mr. Walmsley, the Assistant-Engineer, to make the presentation, which consisted of a handsome quarter-chime mahogany clock, inlaid with brass, and bearing the following inscription: "Presented to John Bond, Esq., by the Gas Works Employees, Crowlands, Southport, on the occasion of his Marriage, September 1st, 1909." Mr. Walmisley said it afforded him very great pleasure, on behalf of the employees of the Southport Gas-Works at Crowlands, to make the presentation, as a token of their high appreciation and esteem of their worthy chief, on the occasion of his marriage. It was needless to say that he was voicing the opinion of all present when he wished Mr. Bond and the bride-elect long life, good health, and prosperity. He trusted Mr. Bond would long be spared to look upon the timepiece with many pleasant reminiscences of the Southport Gas. Works. Mr. Bond, in acknowledging the gift, said he felt sure, when he first became acquainted with the officials and workmen of the Gas Department, that his lot would be a happy one. Now that he had been with them for more than five years, he could with confidence tell them that his first impressions of their capabilities had been fully realized; and he felt proud to know that he had friends about him of the very highest order. He looked upon and accepted their handsome present as a seal of their friendship, and also as a token that marked the time in his affairs which he would always greatly treasure. He thanked them most heartily for the kind words which had been spoken not only to him but also for his future wife, and for their handsome gift.

LARGE GAS-ENGINES.

The technical portion of the proceedings connected with last Saturday's "Engineering Day" at the White City included an interesting lecture on "Large Gas-Engines," by Mr. Percy R. Allen, who displayed in connection with it a number of lantern slides illustrating engines and plant of different kinds. He also provided a fine collection of gas-engine photographs, drawings, and models, which were arranged for inspection in the Machinery Hall. The meetings were held in the Congress Hall; and each paper or lecture was presided over by a gentleman prominently associated with the particular branch of engineering which was the subject of the contribution.

Mr. Dugald Clerk most appropriately filled the chair during the lecture on "Large Gas-Engines;" and in opening the proceedings, he remarked that Mr. Allen was very well qualified to tell them about the matter with which he was going to deal, because he was Engineer to a large Company who employed gas power for the generation of electricity; and in the works he had some large Körting engines operating on the Clerk cycle, some National engines, and some engines of the Westinghouse type. He had also been studying the whole question on the Continent, and so was in a position to inform them how far the gas-engine had developed, in the large size, for different industries. It was a matter of great importance to the United Kingdom, because it had been said by some that this country was behind the rest of the world with the large gas-engine. He (Mr. Dugald Clerk) did not agree with this. Englishmen built things when they thought it would pay them to do so; and as soon as those who were engaged in the industry felt that they were going to make money by the construction of large gas-engines, it would be found that plenty of them would be built. At present the question was in the initial stage, which must, of course, be passed through; but work was being done in this country, as well as elsewhere.

Mr. Allen (whose lecture was read for him by Mr. W. Yorath Lewis, the Hon. Secretary to the conference) at the outset stated his intention to deal with the aspect of the gas-engine, as compared with steam power, on somewhat general lines. Tracing the history of the subject, he remarked that the gas-engine might be considered to have become a really commercial machine when Dr. Nicholas Otto designed his first engine using the Beau de Rochas cycle, in 1875. The manufacture of these engines was undertaken by the firm of Otto and Langen, which had since developed into the well-known Gasmotoren Fabrik Deutz. About this time Messrs. Crossley Bros. made arrangements to build this type of engine in England; and since then an enormous number had been constructed on this system, which soon became known as the Otto cycle. This cycle he explained at length, showing a number of slides of representative engines built by Messrs. Crossley. Between 1875 and 1895, he continued, there was no very striking change made in the general design of this type of engine; but when, in 1894, the late Mr. H. B. Thwaite demonstrated that, by taking blast-furnace gas and properly cleaning and cooling it, it became possible to use it in gas-engines with a fairly high degree of compression, he opened up an enormous field for the profitable employment of large internal combustion engines, the full importance of which seemed hardly appreciated yet, at all events in this country. Although Thwaite's patent appeared to have slightly ante-dated that of anyone else, in 1895 the John Cockerill Company had a small gas-engine working on blast-furnace gas; and in less than five years they had developed the idea to such an extent that they were enabled to show at the Paris Exhibition in 1900 a large blowing engine intended to be driven by blast-furnace gas, and capable of developing 600 H.P. in a single cylinder. This engine was still at work at Seraing. In Germany, the idea of using blast-furnace and coke-oven gases was at once taken up; and a gas-engine working on the Oechelhaeuser two-cycle system was constructed and put to work in 1898 at the Hoerde Iron and Steel Works, near Dortmund. This engine developed upwards of 600 H.P., and led the other makers building the Otto type of engine to seek to increase their power by multiplying the cylinders; a 1000 H.P. four-cylinder *vis-à-vis* twin engine being supplied by the Gasmotoren Fabrik Deutz and put up in the same house at Hoerde. However, by 1904, the Deutz Company had quite remodelled their engine; and, while retaining the Otto cycle, made the cylinders double-acting. Since then, with various modifications, nearly all the makers of large engines using the Otto cycle on the Continent and in America had built them double-acting.

The two-cycle engine, said the author, seemed really to have been first practically worked out by Mr. Dugald Clerk; but it was apparently not built on any large scale until the Oechelhaeuser and the Körting engines began to be constructed. Though both these types of engines were always spoken of as "two-cycle" engines, there was considerable difference in their exact action. This difference he indicated at length. There were, he added, several possible systems of working outside the four-cycle Otto and the two-cycle Körting or Oechelhaeuser; but they were not at present put into practical use. The six-stroke cycle, in which, after the exhaust stroke, a separate charge of pure air was drawn in, and then expelled between the exhaust stroke and the suction stroke, came in for a certain amount of favour. It no doubt formed a most effective scavenge; but the same result had since

been obtained—particularly in the Premier engine—with a four-stroke cycle combined with an independent air-pump for supplementing the discharge from the exhaust.

After dealing with further constructional details, Mr. Allen went on to say that the internal combustion engine differed from the steam-engine inasmuch as a certain amount of heat had to be deliberately wasted—that was, the cylinders, the cylinder-heads, and in large engines the pistons and exhaust-valves, had to be water-cooled; otherwise the cumulative effects of the succession of explosions would raise the temperature to such a degree that the engine would cease to act. It had frequently been proposed to utilize the heat in the cylinder jackets as a means of raising steam, which could be used to help the output of the main engine. From one point of view there was nothing wrong in theory about this; and with the recent developments made in exhaust steam turbines, it was open to consideration whether it might not pay in a large installation, even taking into account the extra capital outlay. However, while this possible economy had only been dealt with in an experimental way, the heat rejected in the exhaust was now systematically made use of—the burned gases being turned through a multitubular boiler before passing into the atmosphere. An ordinary gas-engine might be roughly reckoned to consume about 70 cubic feet of producer gas having a value of 145 B.Th.U. per cubic foot per brake horse power hour; and this would be found to raise about 2 lbs. of steam at 70 lbs. pressure for each brake horse power hour exerted. Of course, the more efficient the engine, the less heat there was to be caught in the exhaust; but at the same time, where there was any possible use for steam or hot water, the exhaust boiler had come to be recognized as a necessary adjunct to the engine.

The earliest gas-engines were, the author pointed out, almost always worked off town gas; and up till quite recently this had invariably been produced with the idea of getting the greatest possible amount of light from it, quite independent of its heating properties. However, when it came to be generally recognized that the gas-engine was a comparatively economical machine, even with town gas, inventors began to devise apparatus for producing gas more specifically adapted for power purposes. There was a long list of inventors of gas-producers; but Wilson and Dowson were among the first to give serious attention to such plants for motive power. At present producers were upon the market which would gasify almost anything containing carbon. In 1895, Bénier, a French inventor, patented the idea of a suction gas producer; and this idea was taken up with great vigour, and had been more largely used than even the inventor could have contemplated. Suction plants were now offered up to about 600 or 700 H.P.; but as yet they were not adapted for fuels of a bituminous nature. One of the most remarkable suction plants with which he was acquainted was supplied by Messrs. Crossley to a Liverpool firm. Here three suction gas producers were placed on the roof of a very high building, and supplied gas to three engines working in parallel in the basement. Producers using oil as a fuel had been to some extent used.

Mr. Allen remarked that very considerable impetus was given to the construction of large gas-engines in this country when the Mond system of using bituminous fuels and gasifying them at a low temperature (at the same time recovering sulphate of ammonia as a bye-product) was proposed. He explained fully, with the aid of lantern slides, the construction and working of the Mond and Duff producers, and then indicated the efforts made by Messrs. Crossley and the Power Gas Corporation to simplify the working of ammonia-recovery plants. Continuing, he remarked that, as most people were probably aware, a large amount of experimenting had been done in years gone by with regard to the utilization of peat as a fuel. Up to the present, this had never been much of a commercial success; but it would seem that in the recent developments of large producer plants and bye-product recovery apparatus, peat might become quite a payable proposition for them to deal with. In this connection, he referred to the work that had been done by Captain H. Riall Sankey. As to the future price of sulphate of ammonia, the author said that, though the production had enormously increased of late years, the opinion of those agriculturists who had studied the subject most seemed to be that in the next 25 years the demand for artificial fertilizers for the regular production of the wheat crop would lead to a large and permanently increasing demand for nitrogenous compounds, not as bye-products, but as staple articles.

Coming to a short consideration of the commercial comparison between the gas-engine or internal combustion engines generally and the steam-engine, Mr. Allen thought it might be safely stated that the consumption of fuel in a gas-engine was only about half that in a steam-engine—or, rather, about 17·5 to 9·5. The steam-engine consumption had no doubt been improved of recent years, but still under ordinary conditions there would be a marked economy of fuel in connection with a gas-engine; and if the installation were large enough to justify an ammonia recovery plant, there would in the first place be a saving of one-third of the fuel, and then there would be received back (say) one-third of the value of the slack in the form of bye-products. Installations of 20,000 H.P. and upwards, driven by large gas-engines, were now to be met with in several places. Most of the Continental steel works did not deem it necessary to provide any spare steam plant as a stand-by for their gas-engines; so that the practicability of working a large gas-driven station might be taken as settled. However, in this country the electrical engineer, who was responsible for most of the power schemes that came forward, had hesitated, on the ground of capital expenditure, to recommend large units and producer plants; the argument being that if there was a poor load-factor running in an uncertain manner during the 24 hours, one was not justified in spending the extra money on the more economical gas-engine, instead of the cheaper turbine which used more fuel. This matter was, of course, governed largely by the arrangements it might be thought prudent to make for interest and depreciation, sinking fund, or redemption charges, which were more or less settled by the commercial management of the enterprise, and with regard to which a great amount of argument might be indulged in.

At the present moment, the capital expenditure involved on a 10,000 kilowatt plant, with gas-engines, producers, and recovery apparatus, would be about £17 per kilowatt; while with a steam condensing plant and large turbines it would be somewhere between £12 and £14. It must be admitted, he said, that now the large gas-engine was a more expensive machine to construct than a steam-engine, or especially a steam-turbine; and the reason of this could be understood. To obtain a mean effective pressure of (say) 70 lbs. in a gas-engine cylinder, the crank-shafts, bearings, and all the working parts had to be made to stand the explosion pressure—say, 350 lbs.; while in a steam-engine the maximum pressure coming on any part rarely exceeded from 180 to 200 lbs. But assuming for the moment that the capital expenditure on a large gas-engine plant with producers was too high, directly one began to use the engine in connection with the waste gases from blast-furnaces or coke-ovens, the position was quite different. In the blast-furnace and coke-oven, there was the producer already made; the gas was burned in the engine to just twice the advantage as was the case under the boilers; the space occupied by the plant was smaller; and the total capital cost worked out less. Unless some means could be devised for producing a fuel equal to coal, they were under a moral obligation to their successors to be as sparing with coal as possible; and moreover virtue was sometimes its own reward. In a time of shortage of supplies from any cause, an engineer with a gas plant who had 1000 tons of coal on hand would be in a position to carry on operations just twice as long as his neighbour with a similar amount who had stuck to steam.

The lecturer concluded with a few remarks on oil-engines of the Diesel type, and their utilization for marine purposes.

Mr. Dugald Clerk, in proposing a vote of thanks to Mr. Allen, remarked that there was no time for discussion upon what they had heard. It was marvellous to think that every possible fuel now—liquid, solid, and gaseous—had been pressed into the service of the internal combustion engine. When he (the speaker) began work in 1876, the largest gas-engine in England was only 3 H.P.; while now there were engines of 2000 H.P. at Beardmore's works in Glasgow, on the Oechelhaeuser system, and in Mr. Allen's own works there was a Westinghouse engine of 1000 H.P., a Körting engine of 750 H.P., and some smaller ones. There was no doubt at all that the large gas-engine was coming much into commercial use; and he trusted that England in the future would take a foremost place in the building of such engines—on better lines, he hoped, than anyone else.

Mr. F. L. Rawson having seconded the vote, it was heartily accorded; and Mr. Allen briefly acknowledged it.

Glover-West Vertical Retorts for Manchester.

The Chairman (Mr. Alderman Gibson) and the Gas Committee of the Manchester Corporation, together with their Engineer (Mr. J. G. Newbigging, M.Inst.C.E.), and the Managers of the various stations, recently visited St. Helens, and inspected the working of the Glover and West vertical retorts; and, on the recommendation of their Engineer, they decided to consider the advisability of erecting an installation at one of their stations. A proposal was at once invited from West's Gas Improvement Company, Limited, for a complete installation, including a suitable retort-house building and coal-store; and the Gas Committee have accepted it. The installation will be erected at the Droylsden Gas-Works, where it will be possible to make complete and separate tests of the working of the vertical retorts against the existing carbonizing plant. In view of the fact that the Engineer will shortly have to draw up plans for works of a capacity of 10 million cubic feet of gas per diem, the results from this installation of vertical retorts will be a guide as to the carbonizing methods to be adopted.

High-Pressure Gas Lighting at the Alexandra Palace.—At a meeting of the Alexandra Park Trustees last week, the Executive Committee reported that arrangements had been entered into with the Tottenham and Edmonton Gas Company for installing plant for high-pressure lighting, by which not only would a certain portion of the palace and grounds be more efficiently lighted, but a very considerable saving would be effected in the annual cost. The erection of the necessary plant was now in hand, and it was expected that the improved lighting would in a short time be in operation in the central hall, corridors, industrial hall, exhibition department, skating rink, terraces, &c. The plant—consisting of engines, compressors, central control-board, &c.—was being erected in the exhibition department; and as it was enclosed in a glass case, it was thought that it would be an object of great interest to the public visiting the building.

TAR MACADAM FOR ROADS.

At the last Annual Meeting of the Wisconsin Gas Association, Mr. J. D. Taylor, jun., the Manager of the Wausau (Wis.) Gas Company, read a paper on "Tar Macadam," in the course of which he made the following remarks.

We have all taken great interest in the upbuilding of our coke market, spending a considerable amount of money each year in advertising "smokeless fuel," and installing crushers, &c., to find in the end that we are dependent largely upon a seasonable winter to unload our stock, very often having to close out at a low figure at the end of the season to make room for the summer accumulation. The larger plants, of course, all operate and maintain ammonia concentrators; while the managers of the smaller ones are continually figuring as to the possibilities of their doing the same.

The operators of both the large and the small plants seem to overlook the value of their tar, and place the entire output by annual contracts with the few large contracting firms, for which they receive an exceedingly low price compared with that which is charged for the same product after having gone through a slight distillation process, sufficient to make it saleable for street-paving purposes.

A tar macadam road for general purposes is about as durable, efficient, and economical as any street paving known to-day. It is purely a matter of opinion of the various engineers as to the superiority of vitrified brick or creosote block. Of course, there is no question that these are the two best pavements known; but they are only recommended for the principal business streets and heavy traffic thoroughfares of the cities. The paving of the remainder of the streets must be with a less expensive material; and nothing better than tar macadam can be recommended for this purpose.

The advent of the automobile in such large numbers has demonstrated the fact that something must substitute the common macadam road; for the rapid passage of the machines, with their large rubber tyres, forms a suction which draws from the interstices the dust and small stones which blow away from the road, leaving the stone free and ready to be jarred loose by contact with horses' shoes and steel-tyred vehicles. Thus the road becomes frayed and very soon rutted.

The tar macadam road is the one that will stand up under these conditions—a very evident fact when the city of Duluth invest $10,300 in a portable mixing plant, and consider no other street pavement. In fact, you do not have to go any farther than the city of Milwaukee for a demonstration of this fact. The steepest grade on Winconsin Street is tar macadam. I was advised by an engineer familiar with this particular piece of work that it was laid after careful consideration; and that the reasons for laying it were practically protection to the teams which are constantly passing up and down the hill. There is just sufficient rough surface to give a horse good purchase; and while the road is smooth enough for all purposes, it is rough enough not to allow sleet and ice to glaze it over, as in the case of the asphalte to the east and west of it. Farwell Avenue is another good example of a tar macadam street. The heaviest teaming in the city goes north over this thoroughfare, yet after being down a number of years it is in almost perfect condition. The point which I wish to emphasize is this: In the face of this possible market for our product, should we be content to sell our tar from 2 c. to 2½ c. per gallon, and see the same product return to our cities sold at 8 c. per gallon?

The manufacturer to whom we sell this tar simply draws it off into a still, heats it to a temperature of approximately 445° Fahr., at which point a sufficient quantity of the lighter oils has been drawn off, for which the manufacturer receives from 7 c. to 15 c. per gallon, according to whether it is disposed of in barrels or tank lots. The tar is drawn off, barrelled and given a fancy name, with an attractive label, then sold for street paving purposes at prices ranging from 6 c. to 8 c. per gallon. Now, would it not be possible for small cities to divide themselves into groups, selecting a central location at which a tar plant could be erected—a still of not less than 4000 barrels per annum capacity—the expenses to be borne jointly by the group of cities interested, and the price to be paid to each company for their tar to be governed by the sales of the finished products? The tar plant itself need do nothing more than pay its own operating expenses and interest and depreciation charges; the profits belonging to the companies producing the bye-product. Being interested to this extent, we should be more energetic than we are in securing the construction of tar macadam roads in our cities and county highways.

I find that authorities vary considerably as to the proper construction of such roads; but I can speak from personal observation that the following, while it may not be the best, will always be a satisfactory road: Excavation in ordinary clay soil should be about 6 to 8 inches, and on this should be laid a broken stone or concrete base if desired, rolled with a 10 to 15 ton roller. The next stratum is composed of crushed rock not less than ¾ inch to 1½ inches (ring test); the same having been thoroughly heated to remove every particle of moisture. The preparation of the rock is as follows: It is first spread out on a mixed board 12 feet by 15 feet square, and crude tar, which has been heated to about 180° Fahr., is poured over it. The batch is then turned over until every particle of the stone is coated with tar, which can be done in the mixing-machines used for concrete. This is placed on the road and rolled, and it then becomes firmly cemented; the tar practically filling the interstices. The third stratum or finishing surface is composed of granite or limestone screenings, mixed with a sufficient amount of prepared tar to cause the particles to adhere closely to one another. This, in turn, is thoroughly rolled and left to stand for 48 hours. Teaming may then be allowed to go over the road.

In such a road as this, horses' shoes and steel-tyred vehicles will leave a slight impression; but the next passing vehicle will press this out. The road is absolutely dust and water proof, and cannot be torn loose or frayed by the swift passage of automobiles; and when we find that such a road can be constructed at an average cost of $1.20 per square yard, we should all take sufficient interest in our cities to briug this before the county or city Road Commissioners. The manufacturers who make a speciality of preparing this tar for macadam building will tell you that raw tar should never be used in road construction. Their point is naturally well taken; but from the data I have at hand, and from engineers with whom I have conversed on the subject, I gather that crude tar is just as serviceable in the base as the prepared tar, but under no conditions can the crude tar be used for surfacing.

The purpose of this paper is not to instruct or advise as to the construction of tar macadam road, but, if possible, to direct attention towards a tar market which will at least show as favourable results as the balance of our mercantile ledger accouuts. We have all been too ready to let the two or three contracting firms dictate a price to us; and I feel very certain that if we will simply hold together and wake up to the fact that we are producing an article for which these companies must pay us, we can make the tar-well a source of revenue equal to its worth.

PURIFYING POOR GAS FOR USE IN ENGINES.

In nearly all gas-engines worked with poor gas made from lean coal or gas coke, it is found that, whatever may be the kind of producer used and washing and purifying apparatus employed to retain the dust and tar, the valves of the engine become coated with a tarry deposit which makes frequent cleaning necessary. Moreover the tar accumulates in the cylinder in such quantities as to cement the segments. Coke washers, scrubbers, and centrifugal fans with injection of water, are absolutely insufficient to deal with this kind of tar, which is usually very thick, and perfectly solid at the ordinary temperature. Such purifiers cannot be regarded as anything more than roughing apparatus. There always escapes a little tar, which causes the inconvenience in question; and the provision of a remedy is the object of a French patent lately taken out by M. Chevalet.

In order to retain the tar, purification of the gas is completed in a washer; but instead of being supplied with water it is fed with heavy oil, obtained from the distillation of tar. Creosote, whether or not freed from naphthalene, or anthracene oil can be utilized; both having the property of dissolving tar or pitch. Anthracene oil is to be preferred, the boiling-point of which is from 250°C. (482° Fahr.) to 400°C. (752° Fahr.), because creosote oils are slightly acid, and there is danger of the cylinder being attacked if they happen to enter it. The washer may be a coke column, a Kirkham or other mechanical washer, a centrifugal fan with injection of oil, a surface washer containing wood shavings or chips, a Chevalet condensing washer, or any other system. Accordiug to the type of washer employed, the oil is either introduced all at once, as in a mechanical washer, or in a continuous current, as in a coke column or columnar washer; the oil flowing at the base being pumped to the top. The same oil is utilized until, by suitable tests, it is found that it cannot dissolve tar.

This invention utilizes the dissolving properties of the oils specified in relation to tar and pitch. This property is as follows: If a current of gas, whether or not containing particles of tar, is caused to impiuge against surfaces coated with lubricating oil, these particles are retained on the surface of the oil; but there is merely adhesion of tar dust and oil, and not dissolution of tar in oil. This distinction is important. In fact, if the washers are bathed with mineral lubricating oil, tar constantly reaches the engine valves. Experiments were made especially with a Chevalet condenser-washer, which was found to be quite useless in retaining tar when supplied with petroleum or good mineral lubricating oil; whereas when anthracene oil was employed, no trace of tar was found in the gas. Another advantage due to the employment of creosote or anthracene oils is a greater calorific power of the gas. In fact, commercial creosote or anthracene oils often contain a certain amount of naphthalene, which the gas absorbs in the washer, and is thus carburetted.

This method of removing tar is not only applicable to engines, but in all cases where producer gas quite free from tar is required. The creosote and anthracene oils have been specified on account of their efficacy and their cheapness; but the invention includes all oils obtained from the distillation of coal tar boiling at above 150° C. (300° Fahr.).

As recorded in the notice of the half-yearly meeting of the Richmond (Surrey) Gas Company which appears elsewhere, Mr. Thomas May, the Engineer and Secretary, has been presented with a silver tray and other articles, to the value of 100 guineas, on the completion of twenty-five years' service with the Company.

A NEW GASHOLDER AT GREENHITHE.

The erection has just been completed by Messrs. Willey and Co., of London and Exeter, of a three lift gasholder, of a total capacity of 72,000 cubic feet, for the Northfleet and Greenhithe Gas Company, in an existing tank of 43 feet diameter by 15 ft. 6 in. deep. To gain additional storage capacity, the tank was deepened by a steel ring 4 ft. 6 in. deep, jointed to the existing coping—thus doubling the capacity.

The ceremony of turning on the gas was performed by Mr. Harry Keep, the Chairman of the Gas Company, on the 10th ult., in the presence of Mr. Arthur Glover and Mr. W. A. Plunkett (Directors), Mr. C. Foster Veevers, the Secretary and Manager, and Mr. James Dougall, the London Manager of the Contractors.

After the opening ceremony, Mr. Dougall entertained the Chairman and other gentlemen to a lunch, during which the Chairman spoke very highly of the way in which the work had been performed—praising the efficiency shown throughout by Messrs. Willey and Co., and coupling with a toast of "The Contractors" the name of Mr. Dougall, who responded in a speech wishing prosperity to the Gas Company in general and to Mr. Keep and Mr. Veevers in particular.

The accompanying photograph (by Messrs. Daines Bros., of Gravesend) shows the holder on the completion of the work and after it had been inflated. It will be noticed that, owing to very cramped site, the work had to be performed under exceptional difficulties.

AIR-LIFT PUMPING PLANT AT AURORA (ILL.).

The water supply for Aurora (Ill.) is obtained from four deep wells on the bank of the Fox River, about two miles north of the business section. These wells are from 2236 to 2440 feet deep, and 8 to 12 inches in diameter at the surface; their size being stepped-down to 5 and 6 inches at the bottom. They were all driven through alternating layers of shale and sandstone, with occasional strata of limestone. In order to exclude surface water, each well is cased down to the rock with iron pipe. The wells would flow naturally to a certain extent; but, as the requirements are much greater than this flow, an air-lift system has been installed to supply the difference. The city has a population of 30,000, of which it is estimated that three-fourths take water from the distribution system. Last year, the average daily quantity of water pumped from the wells was 1,585,040 gallons.

According to some particulars in "Engineering Record," the air-lift system lowers the water level in the wells so that the average actual lift is about 48 feet. A 2-inch pipe extends down each well to a depth of 230 feet, giving a submergence of 182 feet with the average head. The water raised by the air-lifts is discharged into a 1,300,000-gallon reservoir near the pumping-station. Two compressors furnish power to operate the lifts. One of these, installed in 1902, has a cross-compound condensing steam end fitted with Corliss valves, and a duplex single-stage air end. It has air-valves of the poppet type, and a rated daily capacity of 1100 cubic feet of free air per minute at 75 lbs. pressure. This compressor was in continuous operation for six years without reserve equipment, and without seriously interrupting the water supply of the city at any time during this period. The second compressor has been placed in service only recently to relieve the one which has been in continual use. Since then the older one has been held in reserve in case of accident.

The larger compressor has a cross-compound condensing steam end, and also a cross-compound air end. Between the high-pressure and low-pressure steam cylinders is an interheater, and the discharge from the low-pressure air cylinder is passed through an intercooler before being admitted to the high-pressure air cylinder. Both the interheater and the intercooler are placed beneath the floor of the engine-room. The valves on the steam end and those on the air intake are of the Corliss type. The air discharge-valves are of the sensitive poppet type.

The air is drawn through a pipe that extends above the roof of the pumping-station, and is discharged into a vertical receiver, from which 2-inch pipes lead to each of the wells. At 80 revolutions per minute, the large compressor has a capacity of 2000 feet of free air per minute against a pressure of 115 lbs. This output is greater than is necessary to raise enough water to meet the present requirements of the city; so the machine is operated only 16 to 18 hours a day at 48 revolutions per minute, and against a pressure of 78 lbs.

Three pumps in the station are arranged to discharge into a stand-pipe on a neighbouring hill, or directly into the mains. The pipe is 152 feet high, 18 feet in diameter, and has a capacity of 287,000 gallons. In case of fire, a valve on the discharge-pipe leading to the stand-pipe is closed by means of a small engine in the station, so that the pumps may deliver to the mains direct. Two of the pumps are of the Deane duplex type, with a rated daily capacity of 1½ million gallons apiece, and the third is a Nordberg triple-expansion unit, with a rated daily capacity of 6 million gallons.

SATURATION OF EARTH DAMS.

Many years ago, Mr. Desmond FitzGerald made some measurements of the level of the ground water in one of the earth dams of the Boston Water-Works; and at a later date, the Committee who reported on the earth dam originally intended as a part of the new Croton dam made similar investigations at a number of dams. Beyond the information furnished by these measurements, very little has been known about the subject; and the Bombay Government recently undertook to make further investigations, in order to ascertain the extent of the saturation in the high embankments of the storage-tanks that are a feature of water-supply works in that province. The following particulars in regard to the matter are given in "Engineering Record."

In the Matoba tank, the dam was constructed of clayey material throughout, faced only with a thin moorum skin. Five pipes perforated at 1-foot intervals were sunk vertically into the bank, and the levels recorded to which water rose in the pipes. A line connecting the highest levels indicated the line of saturation. Saturation attained its maximum on the up-stream face, and also towards the base of the down-stream face, three weeks after the highest rise of water in the tank. Towards the top of the down-stream face, however, saturation proceeded more slowly, reaching the maximum 35 days later, by which time the water level had fallen 2·7 feet. It is recorded also that in the following year it took 62 days for the line of saturation to be reached; indicating probably that a year's further consolidation of the bank had improved its impermeability. At the period of highest saturation, there was only 2 ft. 6 in. depth of dry material near the outer toe, and on one occasion a slip occurred there.

The Unkal tank dam was constructed with selected material throughout; care being taken to have a good draining composition in the down-stream section. The central part of the dam has the most clay in its composition, while the down-stream section has the least. The line of saturation accordingly takes a special course. In the first section it begins with what would be a normal slope, but is deflected upwards as it approaches the line of junction with the middle section. This is obviously because the middle section containing the most clay is the most open to saturation. In the middle section itself the line approaches the horizontal in the first half, but in the second half dips to the junction with the third section. In the third section, in consequence of good drainage, the line of saturation keeps quite near the base. The general results of these experiments were summed up as follows: (1) Clay banks are more completely saturated than well drained banks. (2) Clay banks are more slowly saturated and part more slowly with their water of saturation. (3) In high banks it is unsafe to have nothing but clayey material—a down-stream section of well-drained material being essential.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Electric Facilities Bill—Income Tax Assessment.

Sir,—I hear that there is some possibility of the Electric Facilities Bill coming before a Parliamentary Committee; when there will be an opportunity of showing the hardships that exist where gas undertakings are rated to help to make up the deficiency which arises when electricity is sold below cost price by municipal bodies. As this opportunity will be discussed at the next meeting of the Gas Companies Protection Association, it is desirable that those cognizant of instances of this practice should communicate without delay with the Secretary of the Association, Mr. F. E. Cooper, 5, Victoria Street, Westminster.

At the same meeting will also be considered the aggressive attitude lately taken up by some of the collectors in respect of the allowances for depreciation which have necessarily to be charged against revenue to maintain the capital value of the undertaking. It is desirable herein also that the Secretary be informed of any claims which may have been made in that direction.

Palace Chambers, Westminster, S.W., Sept. 4, 1909.

Hy. E. Jones, Chairman,
Gas Companies Protection Association.

Passage of Gas through Orifices.—A correspondent writes: "I shall be glad if any of your readers can tell me if there is a formula for the quantity of air or gas which will pass through a given sized hole at different pressures—say, from 2 to 54 inches water gauge—and say whether the depth of hole has a bearing upon this, first in relation to nipples and secondly to flat plates, and what percentage should be allowed for them hot."

REGISTER OF PATENTS.

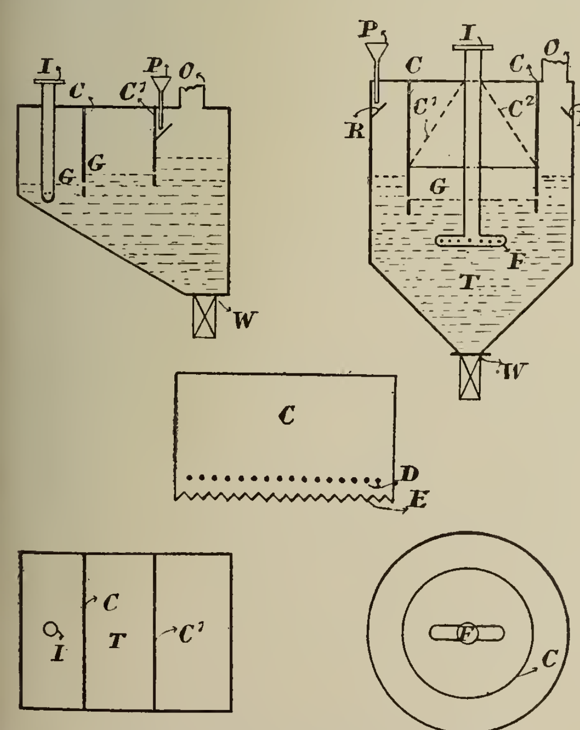
Sulphate of Ammonia Saturator.

Brotherton, E. A., and Wyld, W., of Leeds.

No. 14,349; July 7, 1908.

In the usual type of vessel used for the manufacture of sulphate of ammonia, it has been the general custom, the patentees point out, to distribute the vapours by means of a perforated pipe fixed within the vessel, or by fixing the "bubbling" pipe outside the shell with communications at intervals through the saturator walls. Their invention "accomplishes the work of thoroughly washing the vapours in a vessel of simple construction; and as the gases are delivered into the body of the liquor in the saturator, less local alkalinity takes place—deposits of hard salts thus being prevented."

Their saturator consists of an enclosed vessel having an inclined bottom and one or more depending partitions serrated or/and perforated at their lower extremities. Gas inlet and outlet pipes communicate with the interior; and a liquid distributing trough is placed in the compartment nearest the gas-outlet. The ammoniacal and other vapours as they travel towards the outlet consequently have to pass through a liquid increasing in acidity, and so are "thoroughly washed free from ammonia."



Brotherton and Wyld's Sulphate Saturators.

The gas-inlet I is allowed to dip into the contents of the vessel, and may be elongated in the form of a "tee" or "rose" as at F. From the top of the vessel depend one or more partitions CC^1 perforated or/and serrated at their lower extremities as at D E. These partitions are of such a depth as to secure the requisite seal in the liquid; the acid being delivered by the pipe P into the trough R for better distribution within the tank. If more than one partition is employed, the dip of each succeeding partition towards the outlet is higher than the preceding one.

It has, however, been found that in some cases it is not necessary to use more than one partition when sufficiently immersed in the liquid; but to prevent any absorbable vapours leaving the vessel, two or more partitions C^1 may be introduced of different depths—the absorbable vapours thus on passing through the acid from one side of the partitions to the other being further washed before leaving the vessel by the outlet pipe O.

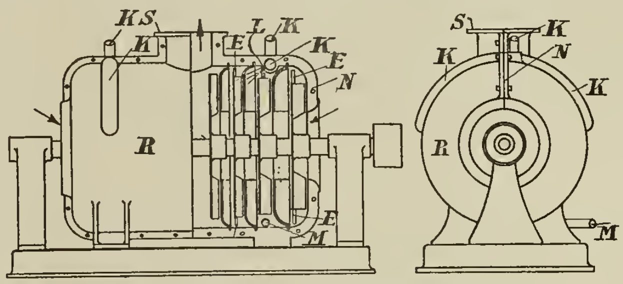
In a cylindrical arrangement of the vessel, the upper portion of the partition C may be dome-shaped, as shown by dotted lines C^{11}; but in either case, by the tank having an inclined bottom converging to an outlet pipe W, provided with a valve, the manufactured product may be readily removed from the interior of the tank.

Turbine Exhausters.

Hodges, R. J., of Devonshire Square, E.C.

No. 18,148; Aug. 29, 1908.

This invention relates to that class of turbine or exhauster blower in which the medium operated upon undergoes successive compressions. It has for its object a form of construction whereby "a much higher degree of efficiency is obtained than hitherto, with greatly reduced speed of revolution, better facility for cleaning the interior, and means for cooling and cleansing the medium during compression."



Hodges' Turbine Exhauster.

In the illustration a front elevation is shown, having part of one-half of the case removed to show the internal parts, an end elevation, and a view of four of the rotor wheels placed one over the other.

The four rotor wheels increase in diameter, but decrease in volumetric capacity, successively in the direction of compression; the curvature of the blades also increasing on each wheel in succession. In addition to the curved blades there are radial blades E of propeller form, which project beyond the periphery of the rotor discs; or, instead of attaching the blades, they may be formed by notching or stamping the rotor wheel discs, which are for that purpose made of corresponding larger diameter. The object of the additional blades is to relieve the pressure at the periphery of the rotor wheels and propel the air with increased velocity into the division plate annulus—"thus greatly increasing the efficiency."

Between each of the rotor wheels are dished annular division plates (with curved guide blades on their hollow sides) made shallower in succession in the direction of compression in order to reduce their capacity annulus successively. The object of increasing the curvature of these guide blades successively is to give a more gradual direction to the gas flow as it becomes more densely compressed.

In order to cleanse or cool the gases during compression, water-ducts K are formed in the upper portion of the casing walls. The ducts are perforated by numerous holes, forming nozzles L, and are so arranged that jets of water traverse the gas issuing from the periphery of the rotor wheels, and then impinge against the division plates—thus forming a spray in the guide vane annulus, after which it escapes by drains at the bottom of the case at M. By this arrangement, the water-jets are prevented from striking the rotor wheels—thereby obviating shock, and economizing the driving power.

To facilitate cleaning the machine when used for dusty or tar-laden gases, or the like, the outer casing is formed in two halves bolted together at the longitudinal vertical joint at N, and the driving shaft, which carries the rotor wheels, is supported by separate pedestals from the bed plate. This arrangement allows the half of the casing R, after unbolting at the joint N and outlet pipe flange S, to be removed without disturbing the adjustment of the rotor wheels, driving mechanism, or pipes.

Gas-Fired Furnaces.

Barnsley, P. G., of Netherton, near Dudley.

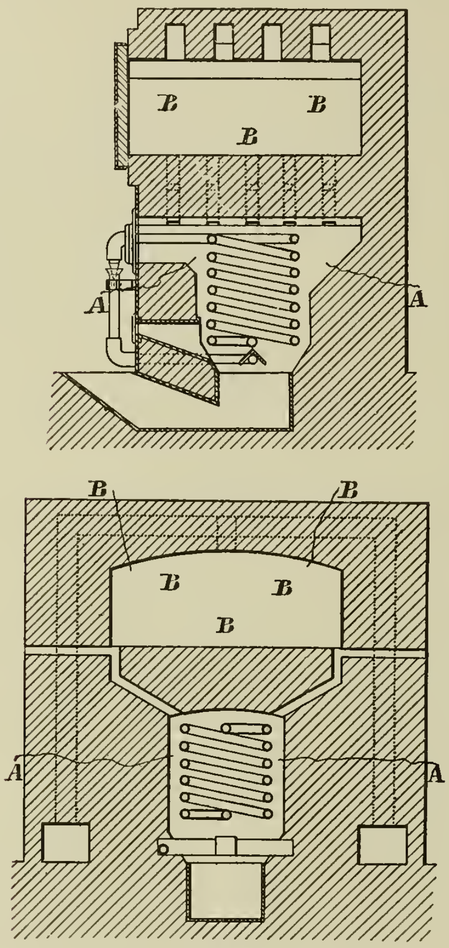
No. 19,018; Sept. 10, 1908.

This invention relates to gas-heating furnaces, such as are used for annealing, case-hardening, and such-like purposes, with the object of providing a self-contained furnace directly fired from a producer, and particularly adapted for the equal heating of articles placed in any position therein.

The example shown is that of a furnace with producer A (of ordinary form) directly beneath the furnace B, so that the top of the producer and the floor of the furnace are the same. The producer (besides having the usual provisions for charging and for blowing or feeding with air and steam) is provided with a coil or battery of pipes in the interior running around the walls. These, supplied with water, serve for supplying steam for the usual steam injector, so that a separate steam generator is not a necessity. From the upper part of the producer gas-flues are provided, which, in the example shown, incline upwards and enter the furnace at the sides of the floor. It is preferred to employ a number of flues, arranged along the side edges of the base of the furnace so as to effect the complete and equal heating of the

furnace. At the points where the flues pass up through the floor of the furnace, air inlets are arranged to pass straight into the flues from the outside, so that the gases distilled off from fuel in the producer are burnt at their entry into the furnace.

It has been previously known to arrange in a furnace in which the combustion chamber is over the producer for the gas and air to meet at once on their entry into the chamber. In the example shown, the products of combustion pass out of the furnace through flues alternately taken down the right and left hand walls of the furnace to a common flue at the base so that a portion of the heat is utilized. Such an arrangement of furnace over the producer is of great advantage, as it economizes floor-space; and (more important still) it enables the heat generated in the producer to assist in heating the furnace, as the portion of the producer most exposed—viz., the roof—is the floor of the furnace.



Barnsley's Gas-Fired Furnaces.

The distribution of the gas-flues shown is said to effect the even heating of the whole furnace; but where a larger furnace is employed more numerous flues may be used, as "it is a great advantage to have practically every part of the furnace at the same heat."

The steam-raising coil in the producer is fed from a tank at a suitable head, and from the upper part of the coil the steam is led to an injector blowing into the producer. This is a very convenient provision for the generation of steam to feed the producer without the necessity of outside plants, thereby enabling the plant to be self-contained. But, in some cases, instead of the pipe coil, a passage may be formed round the walls of the producer closely adjacent to the interior so as to form an encircling or spiral passage-way, and the water may be fed into this for raising steam in a similar manner.

In the example illustrated with a control on the injector as the furnace heats up, more steam can be introduced until a gas very rich in hydrogen is given off at quite a low temperature in the producer; and this, owing to the high calorific value upon combustion at the furnace, gives a very efficient heating of the latter.

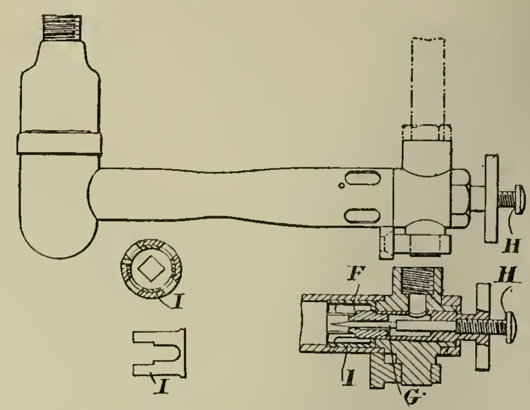
Incandescent Gas-Burners.

COLBRAN, J. B., of Chiswell Street, E.C.

No. 1048; Jan. 15, 1909.

This invention relates to the burners of incandescent gas-lamps of the vertical or overhanging inverted type, provided with means for regulating the supplies of gas and air from outside the lantern. It consists in the usual nozzle to which the burner is attached, a bunsen tube, and a bracket to which the gallery or other part of the frame of the lamp is attached. Carried by the bracket and located exterior to the lamp is the gas-tap, in which is arranged a hollow plug retained in position by a cap which screws on to the body of the gas-tap and terminating in a nozzle F for the supply of gas controlled by the needle-valve G, operated by the screwed head and stem H. To regulate the passage of air through the openings of the bunsen tube, there is arranged therein, and carried by the nozzle of the plug, a correspondingly divided valve, shutter, or baffle I, provided with a square opening to fit on the nozzle of the gas-plug which at its outer end is provided with any suitable arrangement of handle.

To effect the regulation of the supply of air and gas to the bunsen



Colbran's Incandescent Burner Adjuster.

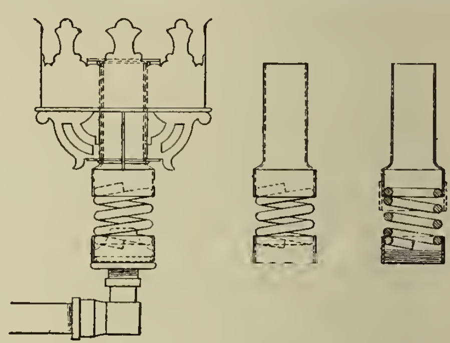
tube, it is only necessary to operate the handle and the screw stem H of the needle-valve, which in the section is shown cutting-off the supply of gas—the travel of the valve or baffle I being limited by a stop which engages in an extended or wider part of one of the slots of the valve.

Anti-Vibration Incandescent Gas-Burner.

OULTON, J., and NEWHOUSE, W. A., of Bradford.

No. 6700; March 20, 1909.

Instead of forming the ordinary air inlets in the bunsen burner for incandescent mantles, the patentees transversely divide the mixing-tube of the burner below the part supporting the mantle and gallery, and interpose a vertical open spiral or helical spring concentric with the gas orifice in the place of the ordinary inlets.



Oulton and Newhouse's Anti-Vibration Incandescent Burner.

The combustion chamber or mixing-tube of the bunsen is transversely divided, and the centre portion (containing the ordinary air inlets) is removed, and an open spiral or helical spring is concentrically interposed between the upper and lower portions. The spring is made separate and connected to the upper and lower portions of the combustion chamber or mixing-tube; or the spring may be made to fit tightly into the ends of the upper and lower portions of the tube by compressing together the spirals at each end of the spring. This latter method "enables the parts to be readily taken from together to be cleaned, besides forming a secure and inexpensive joint."

To regulate the air passing through the air-inlet passage of the mixing-tube, a sliding piece may be fitted telescopically on the lower or upper portions of the tube, and secured in position in any convenient manner.

Gas-Retort Lids.

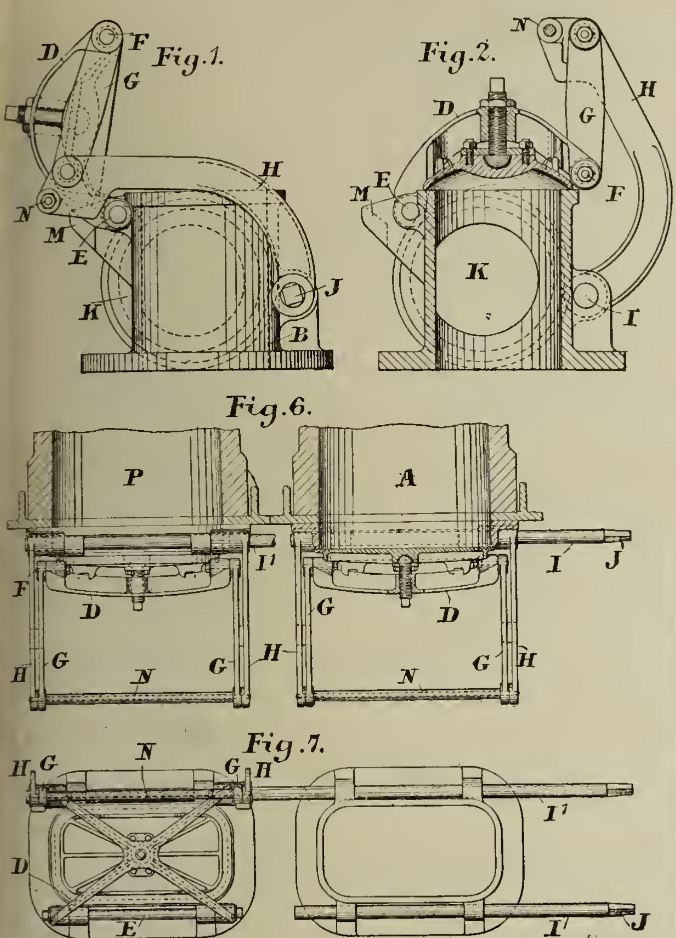
ROBERT DEMPSTER AND SONS, LIMITED, and TOOGOOD, H. J., of Elland.

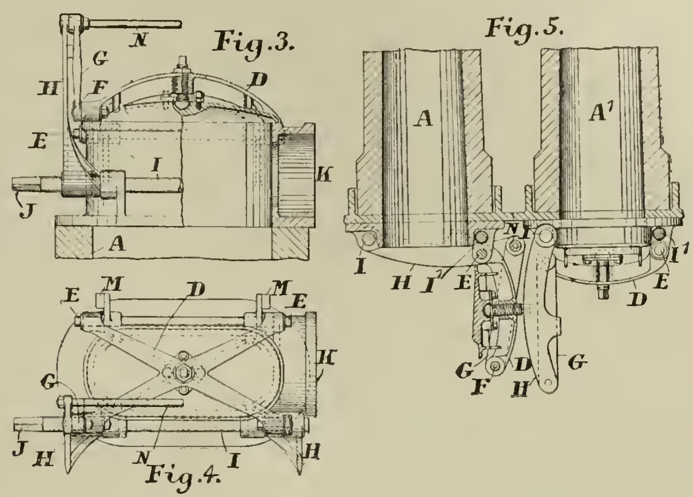
No. 20,850; Oct. 3, 1908.

This invention relating to self-sealing lids of gas-retorts, although especially applicable to the top and bottom lids of vertical retorts, also applies to other forms of retorts.

As is well known, the patentees remark, the opening of the ordinary self-sealing lid, as applied to horizontal and inclined gas-retorts, requires three distinct operations—namely, the lid is first unsealed by operating a handle, next the catch is removed from the end of the crossbar, and then the lid is swung horizontally on its hinges. To close the lid, these three operations are reversed. When applying such lids to vertical retorts, certain modifications become necessary. For example, in the case of the bottom mouthpiece lid, which must sustain the whole weight of the charge, and at the same time remain gas-tight, the lid, instead of swinging horizontally on its hinge, falls when opened into a vertical or nearly vertical position, and, consequently, requires some means to ensure that the lid is held sufficiently open to permit the exit of coke without hindrance. The lid has also to be raised against gravity when closing. As all the operations of actuating the lid must be performed from the outside of the bench—say 8 feet away—there is a difficulty in arranging gearing to perform the required movements for each of a large number of mouthpieces arranged in close formation along the retort-bench. It has been proposed to fit each lid with two rocking-shafts protruding to the front of the bench; one shaft operating the throw-over catch and the sealing eccentric which are present in the ordinary self-sealing lid, while the other shaft effects the actual raising and lowering of the lid—a separate attachment being provided to secure the lid in the full open position during the discharge of the coke.

According to this invention, a system of toggle-jointed levers is arranged to work in conjunction with the hinged crossbar of each lid,





Toogood and Dempster's Lids for Vertical Retorts.

The sealing eccentric and throw-over catch are thus dispensed with, as a single movement of the levers in one direction unseals and opens the lid, while a single movement in the opposite direction closes and seals the lid—the usual three operations being thus resolved into one. Also, as is well known, toggle-jointed levers are capable of exerting great pressure at the moment of their centres coming into line, so that by this means it is possible to obtain the maximum sealing pressure of the lid against the mouthpiece, so as to render it gas-tight even against relatively high pressures of gas, and, in the case of bottom lids, against the heavy weight of the charge in the retort.

Fig. 1 is a front elevation of the top mouthpiece of a retort with the lid open. Fig. 2 is a vertical section of the mouthpiece with the lid closed and sealed. Fig. 3 is a side elevation, partly in section. Fig. 4 is a plan. Fig. 5 is a vertical section of two bottom mouthpieces in the same row, the lid (in section) of the retort A being open, and that of the retort A^1 closed. Fig. 6 is a vertical section at right angles to fig. 5, through two bottom mouthpieces opposite one another in adjacent rows—both lids being closed. Fig. 7 is an inverted plan of the mouthpieces in fig. 6, with the lid of the retort in the front row removed.

The retort lid crossbar D is hinged on the stud or pin E and connected at F to the toggle-lever arm G. The other toggle-lever arm H is secured upon a rocking-shaft I, the end J of which is adapted to be engaged by a lever not shown. This rocking-shaft may, however, be worked by a worm, rack, screw, or any other desirable means. K is the ordinary gas-outlet. A stop-piece M formed on the web carrying the pin E limits the movement of the crossbar D in the opening stroke. The levers G H, in duplicate, are connected by the stay-rod N.

In figs. 5, 6, and 7, the stays N may be tubular, and the lids of the retorts P in the back row are actuated by shafts I^1, arranged alternately with the shafts I, such shafts passing through clearance holes formed in the lugs which carry the hinge pins E of the lids of the front row.

In order to obviate any slight inequality in the action of the levers G H on opposite sides of the same lid, which may arise from torsion of the shaft I or I^1 between them, a single system of toggle-levers for each lid may be substituted for the duplicate system shown, and the form of the crossbar D may be modified. Instead of the rocking-shaft I, a horizontal handle, or an upright (fixed or detachable) handle may be employed to actuate the toggle-jointed levers. The lever works on a stud, and is provided with a lug to prevent the lever passing beyond the required distance—that is, a predetermined small distance beyond its dead-centre or position of maximum pressure so as to hold the levers in position. Set-screws may be adjusted to limit the amount of play between the lid and crossbar when open; these screws being clear of the lid when closed.

Gas-Producers.

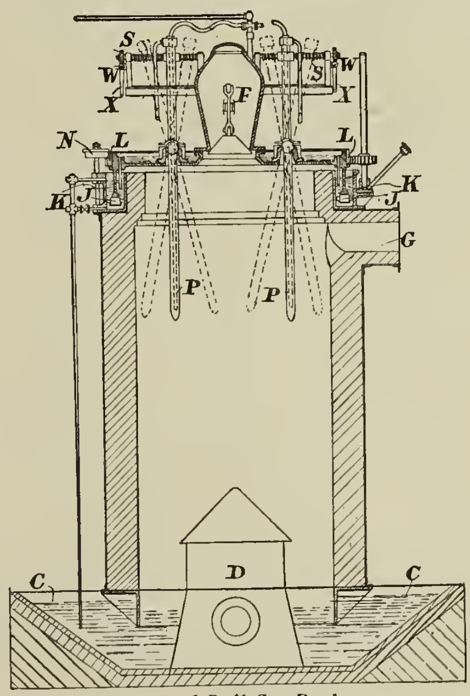
Duff, A. B., of Pittsburg, U.S.A., and the Gas-Power & Bye-Products Company, Limited, of Glasgow.

No. 7780; April 1, 1909.

This invention relates to gas producers with water-cooled and water-luted revolving tops and water-cooled adjustable pokers. The object of this invention is to provide a combination and arrangement of parts which will ensure a thorough disturbance of the top layer of fuel—thus preventing clinkering and caking of the fuel, and ensuring its complete gasification. The producer is particularly suitable for ammonia recovery purposes.

The firebrick-lined casing and the blower are of the usual construction and stationary. The top (water-cooled and water-luted) is carried by a flange depending from its under side and bearing on rollers in the lute, so that rotation is permitted, while the bearings are kept free from dust or grit. The rotation of the top is effected through gearing from any source of power, while a gas-tight joint between the top and the casing is obtained by the flange in the water-lute. Water-cooled pokers are pivoted at or near their centres in the top. Their lower ends project into the upper parts of the fuel, and their upper ends each engage a nut working on a rotatable screwed spindle, so that the lower ends of the pokers may be moved to and from the sides of the casing, or adjusted in position relative to the sides, while also being carried round with the revolving top. This ensures the breaking-up of any particular part of the upper layer of fuel.

As shown, the producer consists of the usual firebrick-lined circular casing carried on angle-iron beams extending across the water-lute trough C from which the ashes are withdrawn, and from which extends up the usual blower grate D. In the centre of the cover or top of the producer is the usual feed-hopper F; and the gas produced passes off by the outlet G. From the under side of the top there projects an annular flange, the lower edge of which runs on rollers J in the bottom of an annular channel K formed around the upper end of the producer casing. On the channel being filled with water, the top is luted—making an effectual gas-tight joint between the casing and the top.



An Improved Duff Gas Producer.

The roller bearings being in the water-lute are kept free from dust or grit, while the lute itself, being beyond the producer wall, is not subjected to great heat. On the outer edge of the top there is a toothed ring L gearing with a pinion on a shaft driven through gearing (not shown) from any source of power, so that on rotation of the shaft the top is made to revolve on the rollers J. Displacement of the top is prevented by guide-rollers N. Pokers P have formed on them, near the centre of their length, trunnions carried in bearings formed or fixed in the top so that their lower ends project into the upper layer of the fuel within the producer, and the upper end of each poker engages in a slot in a nut on a screwed spindle S carried in bearings on the upper ends of standards extending up from brackets secured to the hopper. Each spindle has on it a wormwheel gearing with a worm W on the handled spindle X, on turning which the screwed spindles are rotated, so as to adjust the position of the pokers.

The pokers are cooled by the water supplied through a swivel-jointed pipe connected, by flexible pipes, with the upper ends of the pipes dipping down within the pokers. The water overflows from the pokers on to the upper surface of the top, from which it escapes into the annular channel K from which it overflows. Thus, while the burning of the pokers and top is prevented, a constant depth of lute in the channel K is ensured.

Manufacturing Igniting Compositions.

SCHMITZ, H., of Paris.

No. 9992; April 27, 1909.

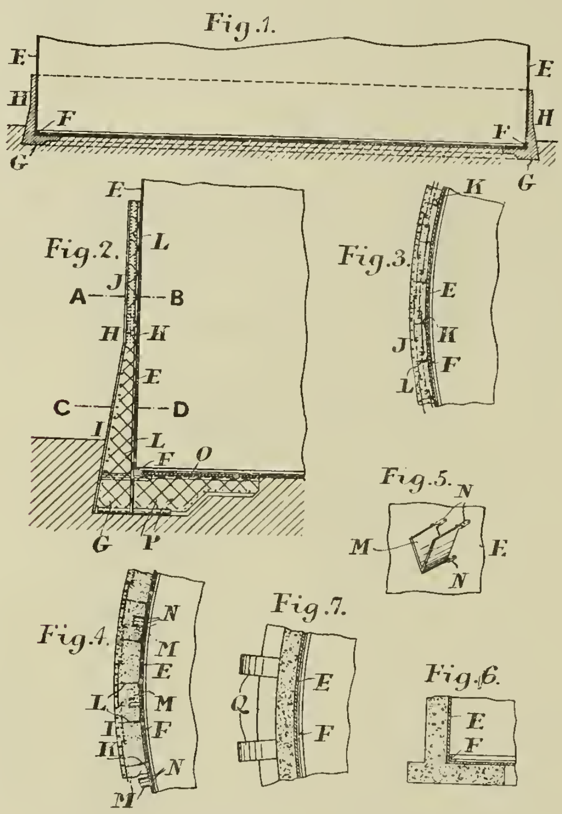
The patentee describes a process for rendering yellow phosphorus more effective as an igniting composition, consisting in producing an artificial intimate mixture of yellow phosphorus with oxygen-yielding salts before admixture with the binding and other materials, by introducing the phosphorus in the hot solution of the salts and shaking the solution with the melted phosphorus during cooling. In this way, an emulsion with the salts crystallizing out is formed, which, after discharging the water, can be used directly for the purpose in question.

Gasholder Tanks.

KILBURN, B. E. D.; a communication from the BERLIN-ANHALTISCHE MASCHINENBAU ACTIEN-GESELLSCHAFT, of Berlin.

No. 10,071; April 28, 1909.

This invention relates to tanks of large diameter—more particularly those intended for liquid or fluids under pressure. Hitherto, the patentees point out, the walls of tanks have been formed of comparatively thick sheet metal, to prevent changes in form consequent on "the severe strains caused by the pressure of the fluid." For this reason, "the use of large tanks having sheet-iron walls is limited, seeing that after a certain thickness the sheet-iron plates cannot satisfactorily be joined and riveted." The inventors' object is "to reduce the thickness of the walls by the particular formation of the lower part of such tanks, thereby enabling the construction of tanks of very large diameter to be readily accomplished."



The B.A.M.A.G. Company's Tank Construction

Accordingly, the outer cylindrical wall of the tank bears against the vertical portion of a ferro-concrete ring of angular cross section; the floor of the tank being in contact with the horizontal portion of the ring, which thus serves as a foundation or support for an annular part thereof—the strain exerted by the fluid upon this horizontal member being equal to, or greater than, the pressure exerted upon the vertical portion of the annular ring. The ferro-concrete ring, in combination with the lower edge of the tank which bears against it, may be regarded as one body formed of angular levers placed beside each other in a circle and connected together. And since the pressure of the fluid in a horizontal or outward direction tends to turn each angle lever outward about the vertex, and the vertical or downward pressure of the fluid acts in opposition to this turning movement, the horizontal arms of the angle levers are made of such dimensions that the resultant of the force acting upon them, and of the outward force acting upon the vertical arms, passes through the vertex of the angle or through the horizontal arm. An outward tilting of the angle lever is thus prevented.

In this construction of tank the sheet-iron walls may be of less thickness, seeing that in the horizontal direction they have only to take up a fraction of the pressure of the fluid, whereas they resist vertical moments of resistance in combination with the ring of ferro-concrete in contact with them. The consequence is that there are practically only tensile strains in the vertical direction in the sheet-iron walls, even in the event of any deflection occurring. The tank thus has the advantage that no separate foundation is required, seeing that the horizontal portion of the angle-ring surrounding the lower portion of the sheet-iron walls is embedded in the bottom of the tank, and serves at the same time as a foundation.

Fig. 1 is a vertical longitudinal section through the lower portion of the tank. Fig. 2 is a vertical section of the bottom part (on a larger scale). Fig. 3 is a section on the line A—B of fig. 2. Fig. 4 is a section on the line C—D. Fig. 5 is a perspective view of a member for connecting the sheet-iron walls to the angle-ring of ferro-concrete. Fig. 6 shows the edge portion of another form of tank or holder in vertical section. Fig. 7 is a horizontal section of the lower part of another modified construction of tank.

In the tank shown (which may be, by way of example, about 250 feet in diameter and about 42 feet high), the cylindrical casing E is composed of sheets which increase in thickness towards the bottom; and sheets of less thickness are joined to these sheets at the lower portion. The lower sheets of the casing are rigidly connected to the sheet-iron bottom of the gas-tank by means of comparatively light angle iron-rings F. This tank made of sheet-iron is, as it were, inserted into an angle-ring of ferro-concrete, the horizontal part G of which is embedded in the adjacent ground, and is in the form of a rigid body rigidly connected to the vertical part H of the ring by means of a suitable joint. The vertical portion of the angle-ring is likewise, up to a certain height, in the form of a rigid body I of ferro-concrete, while its upper part J consists of concrete, simply reinforced by layers or strips of iron to take up any annular tensile strain that may arise in this portion. The inner strips of iron comprise individual ring segments, the ends of which are bent, and which, without further fastening means, are placed horizontally into the mass of concrete in such a manner that they partly overlap each other. Similar iron strips are preferably also provided in the lower ring portion I and in the horizontal ring portion G.

The sheet-iron casing is connected with the vertical part of the iron concrete ring by vertical projections extending into the mass of concrete and comprising angle irons K, secured at certain intervals to the outer circumference of the casing so as to be parallel (or nearly so) with the axis of the tank, and also round-edged iron members or the like L, arranged crosswise—preferably in the lower ring portion and suitably connected to the angle irons K.

The projections extending into the concrete of the vertical portion H of the angular ring prevent the displacement of the casing in the event of its expanding, owing to the pressure of the fluid; the inner layers of iron taking up the annular tensile strains which arise, while the round-edged irons L, placed crosswise, and the angle irons K intimately connect the concrete body with the casing to such an extent that they jointly take up the bending strain in the radial planes.

To ensure a safe connection between the casing and the concrete ring, additional angle members are preferably secured between the angle irons K, the points of which are directed downward, as in fig. 5. These angle pieces, when embedded in the concrete, resist deflection, and, owing to their special arrangement, prevent the formation of hollow spaces as the concrete is being rammed down.

The angle members M are preferably of V cross section and provided with arms N at their inner ends, whereby they are safely fastened to the casing. The arms pass through corresponding holes in the casing, and their projecting ends are riveted over.

It is preferable to secure upon the under side of the sheet-iron bottom of the tank radial angle irons O extending to the outer circumference of the angle ring, round-edged irons P again being fixed to the latter—projecting into the concrete of the horizontal portion G of the ring, which, jointly with the bottom sheet, take up the tensile strains.

The foot of the angle ring of concrete H I may also be T-shaped (as in fig. 6) if desired; and, further, the horizontal portion G may be provided on its outer surface at certain intervals with projections Q, which may be formed as buttresses, as in fig. 7.

APPLICATIONS FOR LETTERS PATENT.

19,357.—KRAUSE, E. H. H., "Gas-furnaces." Aug. 23.
19,382—THAU, A., "Removal of graphite from the ascension-pipes in coke and gas works." Aug. 23.
19,383.—WAKEFIELD, C. C., "Acetylene generators." Aug. 23.
19,419.—BRÖKER, H., "Gas-furnaces." Aug. 24.
19 430.—RESTLER, J. W., "Valves for gas, or other fluids. Aug. 24.
19,435.—EDGAR, W., "Combination gas-fire tap and governor." Aug. 24.
19,444.—NUNES, G. J., "Generating gas for vehicles." Aug. 24.
19,471.—SERVICE, J., "Cover for chimneys used in incandescent gas lighting." Aug. 25.
19,489.—PEEBLES, W. C., "Operating coin-prepayment mechanism from a oistance." Aug. 25.
19,513.—WRIGHT, G. B., "Regenerative furnaces." Aug. 25.
19,534.—FRANK, A, "Meters." Aug. 25.
19,541.—JOLY, C., "Mantles." Aug. 25.
19,552.—TESKE, C., "Leak-detectors for water-pipes and the like." Aug. 25.
19,553.—BLACKBURN, R. W., "Inverted globe holders." Aug. 25.
19,567.—BLAKEY, J. W. & A. G., "Incandescent burners." Aug. 26.
19,571.—BLOORE, A. & J., "Incandescent burners." Aug. 26.
19,639.—CAMBRIDGE, A. S., "Generating gas." Aug. 27.
19,653.—DAVIES, W. W., "Taps or valves." Aug. 27.
19,726.—FRANKLIN, G. M. & D., "Gas-fittings." Aug. 28.
19.736.—ETNA LIGHTING AND HEATING CO., LTD., and BEARD, W. A., "Inverted globe-holders." Aug. 28.
19,767.—KÜPPERS, C., "Measuring gases." Aug. 28.
19.775.—BOCHUM LINDENER ZUNDWAREN UND WETTERLAMPENFABRIK C. KOCH, "Pyrophorous lighting devices for lamps." Aug. 28.

Gas Profits and the Rates at Batley.—In accordance with notice, Mr. Sykes moved, at the last meeting of the Batley Town Council, a resolution to the effect that the Gas Committee should take into consideration the question of reducing the price of gas, instead of devoting the profits to the relief of the rates, as was done at present. He stated that the price of Batley's gas was 2s. 1d. per 1000 cubic feet net; and during the past ten years, no less than £35,774 profit had been derived from the gas undertaking, of which amount £32,400 had been devoted to the relief of the rates. He contended that the domestic consumers were the principal contributors to this profit; and it was they who should derive the benefit by a reduction in the price. After a lengthy discussion, the motion was defeated by eleven votes to five.

MISCELLANEOUS NEWS.

MELBOURNE METROPOLITAN GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices in Melbourne on the 28th of July—Mr. John Grice, the Chairman, presiding.

The Directors reported that the net profits for the half year, including a balance of £2988 brought forward, amounted to £87,820; and they recommended the payment of a dividend at the rate of 5s. per share, amounting to £42,860. A sum of £25,000 had been transferred to the reserve fund, and £5000 each to the meter renewal and depreciation funds and the gas-stoves account; leaving a balance of £4960 to be carried forward.

The Chairman, in moving the adoption of the report, said the quantity of gas sold in the half year was 819,024,000 cubic feet—an increase of 62,000,000 cubic feet on the sales for the June half of 1908. The output then was 48 millions in advance of the corresponding period of 1907. The gas supplied through slot-meters—65,674,000 cubic feet (which was an increase of 19,237,000 cubic feet)—was included in these figures. The number of these meters fixed in consumers' premises on the 30th of June was 13,406, compared with 9721 on the 30th of June, 1908. There was an increase of 38 per cent. in the number of slot-meters, and of 41 per cent. in the amount of gas passing through them. The Directors were steadily and systematically extending the issue of these meters; and as several suburbs were still untouched, there was reason to think this steady increase must continue for some years. As the result of the sales of gas, and the very handsome return of £52,430 from residuals, a balance of £104,242 was carried to the net revenue account, from which the appropriations shown in the report had been made. This was the first time that any amount had been set aside as a depreciation fund for works on leasehold lands, though such a fund was contemplated by, and provided for in, the schedule of the Act of Incorporation. The reason for making this provision was that at the expiration of a short period a 21 years' lease of certain land at the West Melbourne station, on which valuable plant and buildings had been erected, would terminate; and the sum of £5000 was now being set apart for the purpose of writing-down the buildings and fixtures of the Company attached to this land. While the shareholders might be congratulated on the results of the half-year's working, it was necessary, from more than one point of view, that something should be said as to the obligations of the Company arising from the increased volume of business now being done, and from future increases that might reasonably be expected to take place, and for which they must provide in anticipation. The success of to-day was but the forerunner of to-morrow's obligations. The greater consumption of gas by the public entailed larger expenditure for the purpose of providing additional plant and machinery for coping with such increase; and, as a corollary, the greater the quantity of plant in use, the higher the total cost of upkeep. During the past half year, they had benefited materially by the plant at South Melbourne, which, being new, was doing its best work; and they must bear in mind that, notwithstanding all their provisions, they were not likely to have any further new and improved methods completed for nearly four years. Those who did not follow the enormous necessary expenditure of a company like theirs, and the length of time ahead that provision must be made for maintaining the business and providing for its growth, thought, when they saw figures showing what were called "large profits," that the Directors had a simple course in front of them. He presumed it was in consequence of these profits that the Chairman at the meeting might possibly be expected to intimate something in regard to the price of gas in the future. He certainly had not the gift of prophecy, and he was not authorized by his colleagues to do more at present than place some figures before the shareholders to allow their customers to see what call there was on the present earnings and on those of the immediate future. Their duty was to supply the city and suburbs with good gas, and to give satisfaction to their customers by attending to their wants. So much was self-evident; and they were doing their best to accomplish these objects. Each year they, as a Company, did more and more in attending to, and correcting, the defects in pipes and fittings of their clients at a heavy cost to themselves; and if they wished to give satisfaction, this would be an ever-increasing expense. They could not keep pace with the present heavy extra demand, except by laying out large sums on the manufacturing plant. An increase in the capital must, if possible, be avoided. Their capital grew very fast from the end of 1882 to the end of 1892, during which ten years the amount paid out of capital account (independently of the expenditure on plant, &c., from profits that passed through the reserve fund account) increased from £856,000 to £2,077,000—an average for those years of £122,000 per annum. Owing to the collapse, they then for years had more plant than was needed; and when the requirements, after many years, caught up to the plant, the latter had become more or less out of date. So they had had to gradually improve and reconstruct the whole works, as it was necessary in these days of competition to work with the best tools. During the 16½ years from Jan. 1, 1893, the capital expenditure showed an increase of only £72,000 in all. Since 1904, all expenditure for capital purposes had come out of profits through the reserved fund account. The shareholders were well acquainted with the Act of Incorporation, which allowed 8 per cent. dividend when the price of gas was 7s. 6d., and an increase of 1 per cent. for every reduction in the price of gas of 2½d. per 1000 cubic feet. This full payment of dividend had not for years been offered by the Directors nor demanded by the shareholders. Thanks to this cordial support in conserving the funds, much had been done in the way of improvements in the past; but they must all quite clearly understand that much still remained to be done. The Directors appreciated the way in which the shareholders had accepted the reasonable proposals as regarded the distribution of profits put before them on previous occasions, believing it to be in the best interests of the community and themselves that a large proportion of these profits should be invested in the business. He thought there was a great misunderstanding among the public, and especially among gas consumers, as to the amounts earned by gas companies on the capital invested; and their clients were apparently not aware that the shareholders of the Company had for many years been taking a much smaller dividend than that to which they were entitled. It was generally indefinitely stated that 10 per cent. was being paid by the Gas Company; and no doubt this was understood by many to mean that those who found the whole of the capital of £2,121,745 for the land, buildings, plant, machines, gasholders, mains, services, meters, &c., were receiving a return of 10 per cent., which would amount to £212,174 per annum. This was very far from being correct. The facts were that the premium capital of £466,535 found by the shareholders was not receiving any return at all; the debentures (£798,000) were receiving between 4 and 5 per cent., totalling £37,770; and the shareholders, for their £857,210, were getting 10 per cent., equal to £85,720. The whole interest received, therefore, by those who found the cash for the Company, instead of being £212,000, amounted to £123,490, or £5 16s. per cent. per annum. The shareholders only received on their share and premium capital 6½ per cent., which was not too high a return, but rather on the low side, for they had risks common to trading concerns, as was shown by the drop in their business between 1891 and 1898, and the rise from 1898 to 1909. It was well, too, before counting on future profits, to look closely at the present balance-sheet, and see that more than 20 per cent. of their returns were derived from residuals—a magnificent return, but subject to still more of the risks of competition than gas. However, they could congratulate themselves on these returns amounting to £52,000, as it established a record. The ordinary expenditure for new mains, services, ordinary and slot meters, depreciation on stoves and fittings, &c., independently of the works altogether, amounted, in consequence of the increased business, to about £22,000 each half year; and these moneys had all to be passed through and paid from reserve funds. The large amounts which had been transferred each half year to these funds were virtually all absorbed by current expenditure; and consequently the reserve fund and the meter renewal fund were now approximately the same as they were five years ago, and less than twenty years ago. Owing to these demands, there had been no possibility of building up as strong a reserve fund as a company with such a large capital as theirs should have as a safeguard against contingencies. In addition to the ordinary expenditure already referred to, it was probable, while new retort-houses and improvements on those now existing and alterations in plant were going on at the works, that there would be for these purposes at least an equal amount of expenditure to be added to the sum stated. After referring to the necessity for constructing a new retort-house, probably at West Melbourne, before proceeding any further with the reconstruction of the South Melbourne retort-house—works which would entail a heavy expenditure—the Chairman said there would be no difficulty, with continued prosperity, in finding the money. Summarizing his remarks, he said the duty of the Company was to provide the gas required by the community. In order to do this these works must go on; but they could not go on without funds, and those funds must come out of profits. If they reduced the price of gas at present—and a very small reduction meant an enormous sum to the Company—the profits would not be sufficient to enable them to erect modern plant with the necessary despatch. These should be sufficient reasons; but it might do no harm to mention other subsidiary causes for what one of their shareholders called the "Scotch conservatism of the Board." First, the Company had £410,000 of debentures, bearing 5 per cent. interest, maturing next year. It was expedient to get this arranged for on satisfactory terms. The stronger the cash position of the Company, the better price they could get for their debentures. Secondly, the termination of their three-years coal contract was on the 31st of March next. As they carbonized 85,000 tons of coal during the past half year, which meant between 170,000 and 180,000 tons for the year, the shareholders would see how much they were affected by a rise or fall in the price of this commodity; and, bearing on this, there had recently been a great deal of unrest at Newcastle. A coal miners' strike meant very heavy loss to the Company. The men at the Hetton mine, from which they received two-thirds of their supplies, were not working; but they had been able to obtain supplies elsewhere for some weeks.

Mr. A. O. Sachse seconded the motion; and it was carried.

The dividend recommended was then declared; and the proceedings concluded with a vote of thanks to the Chairman, Directors, and staff.

AUSTRALIAN GASLIGHT COMPANY.

The Annual Meeting of this Company was held at the Head Offices in Sydney on the 29th of July—Mr. G. J. Cohen, the Chairman, presiding.

The Secretary (Mr. R. J. Lukey) having read the notice convening the meeting, the report of the Directors was presented. It set forth that the net profits for the half year ended the 30th of June, with the balance brought forward, amounted to £67,652; and the Directors recommended the payment of a dividend for the six months of 9s. per share on the old shares and in proportion on the new shares, free of income-tax. This would absorb, in round figures, £60,000, and leave £7652 to be carried forward. At the date of the meeting, the Engineer (Mr. Thomas J. Bush, M.Inst.C.E.) was in England; and the Directors mentioned that during his visit he would personally inspect the latest improvements in the gas industry.

The Chairman, in moving the adoption of the report, said the increase in the consumption of gas had been well maintained during the half year throughout the whole of the districts covered by the Company's operations. Another satisfactory feature was that, in the city proper, the consumption had never receded, despite the strong competition of the electric light. In this, however, they were only participating in the experience of gas companies in the United Kingdom and on the Continent. The quantity of gas sold during the past six months exceeded that of the corresponding period of last year by 67 million cubic feet—an increase of 6½ per cent. Although this was exceedingly satisfactory, it was, he was sorry to say, more than counter-

balanced by extra expenditure for wages and increased charges for maintenance. The returns from residuals were somewhat disappointing. Sulphate of ammonia, presumably owing to over-production, had been sold at a considerably lower price as compared with that ruling twelve months ago. Coke commanded a good sale. The amount to be disposed of was now much greater than formerly, owing to the increased quantity of coal used in the manufacture of gas; but no accumulation of stocks had to be recorded. Tar alone of all the residuals showed a favourable return. This was owing to the increased demand for it for asphalting and other purposes. The increased consumption of gas, while most encouraging, brought some little anxiety to the Directors, because in some parts of the immense area controlled by the Company the existing mains were undoubtedly being overworked, particularly in the evenings, between the hours of 5 and 7, when gas-cookers were in general use. These defects were more noticeable during the winter months. These difficulties were being met by the laying of either larger or additional pipes in the districts affected. During the past half year, an agreement had been entered into with the outdoor workers, lamplighters, and gas-fitters branches of the Gas Employees' Union; thus bringing into line all the Company's workmen. This agreement was concurrent with the Gas Employees' agreement, and terminated in May, 1911. The action of the Directors in co-operating with the North Shore Gas Company for the establishment of a Wages Board was taken solely for the purpose of settling the question of "Umpire" in case of a dispute, which is not provided for in the existing agreement. Their Engineer (Mr. T. J. Bush) was in England, on leave of absence, partly on account of his health, but more particularly for the purpose of seeing for himself the latest improvements in matters appertaining to gas manufacture, both in the United Kingdom and on the Continent. The report of the Royal Commission on Sydney Improvement had been presented to the Government, and was, he understood, being considered by the Cabinet. He had no further information to impart respecting the suggested resumption of the Company's Head Station at Kent Street, other than that the Commission had confirmed the recommendation. He referred in his last address to the high-pressure inverted incandescent gas lighting of Fleet Street, London. The Company had received samples of these lamps in time to allow of their being exhibited at the Technical College during the late exhibition. Arrangements were now being made to exhibit the lamps in the centre of the City. The public lights had increased during the past half year by 164, thus bringing the total number now in use to 11,457. The agreement made with the lamplighters had greatly increased the cost of lighting; the slight profit hitherto made on this branch of the business having been thereby considerably diminished. The gas-cooker sales numbered 776 during the six months; making the total disposed of by the Company to date 18,375. Record attendances at the weekly lectures had been reported. This undoubtedly accounted for the increased interest shown in gas cookery during the past few years. The day consumption of gas showed considerable advance, and now equalled 46·4 per cent. of the total deliveries. The number of gas consumers had increased by 2633 during the six months—2091 ordinary and 531 prepayment, the total now on the books being 88,647. Extensions of the Company's business had made it necessary to lay 46 miles of additional mains and services in the half year; bringing the total mileage up to 2376.

The report was adopted, and the dividend recommended for the half year—viz., 9s. per share on the old shares and in proportion on the new shares, free of income-tax—was agreed to.

The retiring Directors and Auditors having been re-elected, the Directors and officers were thanked for their efficient services during the half year.

PROVINCIAL GAS AND WATER COMPANIES.

Gas.

Difficulties of Gas Supply in a Colliery Town.

In moving the adoption of the report and accounts at the recent annual meeting of the Barnsley Gas Company, the Chairman (Mr. E. G. Lancaster) said that, comparing the balance-sheet with that for the preceding year, the manufacture of gas had cost £206 more; but they had spent £416 less on other items under this head, and had a saving of £210. The cost of distribution showed an increase in one item of £1035, of which repairs and maintenance had come to £597 more. Rates and taxes had increased by £706—a charge which pressed very heavily on the Company, and which seemed to increase every year. The result was a net increase of expenditure of £620. On the revenue side, they received £676 more from gas; but residuals had produced £175 less, and the net increase was £398. The result was that they were £220 worse off than before. They often heard it said that, Barnsley being in the centre of the coalfield, they ought to make gas cheaper than anyone else. This was a popular fallacy which on examination faded away. The reason they could not maintain their maximum dividend was because underneath them the coal had been worked. The town was becoming fairly solid again; but to the east the ground was constantly giving, and men were continually at work repairing and renewing the mains. The leakage was excessive. They had now relaid a portion of their mains with steel pipes, which had proved very satisfactory. They had not relaid the whole, because of the increased expenditure. He was not exaggerating when he said one item alone came to £500, which was absolute loss. Then they had a growing expenditure on slot meters; but they hoped to see the end of this during the next two or three years. They would, however, get a return on this expenditure. Then they were sanguine enough to hope they would get back to their full dividends, and also do something for their customers. The report was adopted. Mr. J. Brown, the retiring Director, Mr. J. Laycock, of Keighley, in succession to Mr. S. J. Cooper, who has retired, and Mr. Henry Musgrave, of Blackpool, in succession to the late Mr. Wood, were elected Directors, and Mr. Moulton was re-elected Auditor.

Depressed Trade Affects Sales at Hartlepool.

At the annual general meeting of shareholders in the Hartlepool Gas and Water Company last Tuesday, the report and balance-sheet presented for the year ended June 30 showed that the total revenue amounted to £87,339, against an expenditure, including interest on loans, of £54,383; leaving a balance of £32,956 for the year. An interim dividend was paid in March last; and the Directors recommended the declaration of a like dividend for the past half year at the rate of 5 per cent. per annum on the whole of the paid-up consolidated capital, less income-tax. The Directors stated that, in common with other seaports on the north-east coast, trade in the Hartlepools during the past year had been most unsatisfactory and depressed; consequently there had been a decrease in the sales of both gas and water. It was hoped, however, that the current year would show an improvement in the shipping trade and other industries in the district. The Chairman (Mr. T. Appleby), in moving the adoption of the report, expressed his pleasure that it was so satisfactory. When he last addressed the shareholders, he stated that the past twelve months had been a most anxious time for the Directors, owing to the great depression in the trade of the district; and there had been no improvement since, but a still further falling off in the consumption of both gas and water. During the year, an additional 200 slot meters had been fixed; making a total of 7800, and yielding an income of £7681—this amount being a decrease of £456 upon the previous year's revenue from the same source, due, no doubt, to the very large number of empty houses and the decreased earnings of the artisan class. This was apparent from the fact that one house out of every thirteen where these meters were fixed had this year not returned revenue. But, now that work was more plentiful, the returns from this source would doubtless begin to improve. They had been fortunate in getting their coal at lower prices this year; but much of the saving had been absorbed by the reduced revenue from the sale of coke. It was not at all unlikely that next year might see an increased price for coal, due to the Eight Hours Act; and if Lord Joicey's opinion was correct—and there was no better authority on this matter—it was probable that there would in future be a permanently increased price. Though they had cheaper coal, there had been during the year a marked falling off in the price of coke. Not only had the local demand been much less in consequence of the great depression in local industries, but the shipment had fallen away very considerably; and at present there were no indications of better prospects for the current year. The market for tar was still very weak, and showed no improvement upon the previous year. It was thought that the use of it in large quantities as a dust-layer on the public highways would tend to improve the price; but, though much had been done in this direction, and experiments made for its further introduction, it did not seem to have enhanced its value. The average price of sulphate of ammonia had been fairly maintained, and would have been better had the trade with Japan been equal to that of the preceding year. But this trade having been practically suspended for several months, the effect was a falling off in price. It was, however, gratifying to know that trade had now been resumed; for it was one of the most important factors in maintaining good prices. There was again an increase in the amount paid for rates and taxes. Whether or not there would be any limit to these obligations, he did not know; but the increment during the last few years had been considerable, and called for some comment. The Company had an abundant supply of both hard and soft water, for which they would be glad to have additional consumers. The report was adopted.

Steady Growth and Prospective Co-Partnership at Ilford.

At the ordinary half-yearly general meeting of the Ilford Gas Company last Wednesday, the Directors reported a sum of £9820 available for distribution; and they recommended dividends for the six months ending the 30th of June at the rates of 6½ per cent. per annum on the "A" and "C" stocks and 5 per cent. per annum on the "B" stock (less income-tax), with a dividend *pro ratâ* on the "C" stock issued in June; carrying £785 to the reserve fund. In moving the adoption of the report, the Chairman (Mr. W. Ashmole) said the growth of the Company had continued during the past half year, though the increases had been smaller than those of recent years. This was not due to any falling off in the demand for gas, as the consumption per consumer had been well maintained, but to slackness in the building trade in the district. The increase in the half year had, however, been 3·39 per cent. over that of the corresponding period of last year; and, in view of the circumstances, the Board considered this very satisfactory. The works (under Mr. W. B. Farquhar, the Engineer and Manager) had been kept in good repair, and the whole plant overhauled and put in order for the winter's work. In order to protect the Company, it was found necessary to appear by Counsel before the Committee of the House of Commons who considered the Bill promoted by the Gaslight and Coke Company to obtain authority for their amalgamation with the West Ham Gas Company. The shareholders would be glad to learn that the Directors had been successful. The subject of co-partnership, to which some allusion was made at the preceding meeting, was under the consideration of the Board, and they hoped to be able soon to formulate a suitable scheme whch, while having for its immediate object the benefit of those employed by the Company, would also indirectly benefit the stockholders. In conclusion, the Chairman expressed the wish that the Company might have as prosperous a career in the future as it had had in the past. The report was adopted and the dividends recommended were declared; and the proceedings closed with votes of thanks to the Directors, officers, and staff.

Satisfactory Position at Richmond.

At the recent half-yearly general meeting of the Richmond Gas Company, the Directors presented a report in which they recommended a dividend at the rate of 5¼ per cent. per annum on the ordinary stock for the six months ended the 30th of June. The Chairman (Mr. T. J. Carless), in moving the adoption of the report, said the consumption of gas was growing very satisfactorily on the building estate to the east of the gas-works, which promised to be a good revenue producer in the future. Coming to expenditure, coals had cost about the same as during the corresponding period of 1908, when the Company had to face a heavy advance in price; so that their outlay in the past half year was about £1500 above the normal. He was glad to be able to state, however, that the Directors had been fortunate enough to make their new contracts at a considerable reduction; and, fearing that the Mines

(Eight Hours) Act might bring about a rise in prices, they had taken the opportunity to secure themselves for the next two years. Purification had now touched rock-bottom cost; the present figures being lower than he remembered having been recorded since the output of gas approached the present figure. The cost of distribution still grew apace, so much having to be done nowadays to secure new consumers and to keep old ones. Competition for lighting was never so keen as to-day; and the outdoor department of a gas company needed constant and ever-increasing vigilance. Turning to the other side of the account, the amount received for gas sold showed an increase of £747, or something over 4 per cent., which was very gratifying. It was some time since there had been so large an increase in consumption; and when the shareholders remembered how little scope there had been in the neighbourhood of late years, they would appreciate the difficulty experienced in securing an increased output of gas from the works. The receipts for public lighting were somewhat lower through the price per lamp having been brought down; otherwise there had been no shrinkage. The revenue from the rental of meters and stoves and the maintenance of incandescent burners was up somewhat; showing that the business generally was moving in the right direction. Residuals, owing to lower prices ruling, had not brought in quite so much; but, on the whole, they were satisfactory. By reference to the profit and loss account the shareholders would see that they had earned their dividend, which was an important matter; and he congratulated them upon the result of the half-year's working. The immediate future, too, appeared likely to bring equally good returns; and were it not for the drop in the price of coke that had lately taken place, they might have looked for larger profits and all that they brought in their train. The report was adopted, and the dividend declared. The Chairman moved a vote of thanks to Mr. Thomas May (the Engineer and Secretary) and the other officers of the Company. He congratulated Mr. May on having completed 25 years of service, and referred to a presentation of a silver tray and other articles, of the value of 100 guineas, which had been made to him in commemoration of the vent. He hoped the recipient would be spared for another 25 years. Mr. May, in acknowledgment, said that was the fiftieth half-yearly meeting he had attended, and it had always been a great satisfaction to come before the shareholders. The testimonial to which the Chairman had referred was most gratifying for him to receive. He should always value the handsome present; and it would prove an interesting heirloom for his family.

Reduced Price at Ryde.

At the recent annual general meeting of the Ryde Gas Company, the Chairman (Mr. E. Groves, J.P.) presented the report of the Directors, in which they stated that the accounts for the year ended the 30th of June showed a balance available for distribution of £4708, out of which they recommended the payment of the full authorized dividend at the rate of £5 3s. 9d. per cent. The average cost of coal had been less than in the previous year, and was slightly higher than the contract price for future deliveries. The old-fashioned stack of five beds of retorts, rendered obsolete by the introduction of the regenerative system in 1897, had been pulled down, and the site utilized for coal storage. Four beds, each containing eight retorts, had been renewed; and the whole of the plant and apparatus had been well maintained. It had been decided to reduce the price of gas from 3s. 3d. to 3s. 2d. per 1000 cubic feet from the end of July last, which would be equivalent to about £400 per annum; and the Directors hoped it would lead to increased business. The report was adopted. Votes of thanks were accorded to the Directors, the Manager (Mr. F. F. Farrand), the Secretary (Mr. A. E. Coombes), and the staff and employees for their services during the year.

Continued Growth at Shrewsbury.

The report presented at the annual meeting of the Shrewsbury Gas Company last Wednesday stated that the profit on the year's working amounted to £8253. An interim dividend of 2½ per cent. was paid in March last; and the Directors recommended that a final dividend of 3 per cent. (making 5½ per cent. for the year), be now declared, leaving a balance of £2424 in the profit and loss account. The reserve fund amounted to £10,963, and was fully invested. There had been an increase of about 3½ million cubic feet in the consumption of gas during the year. The stoves on hire at June 30 numbered 2899; and there were 3478 slot meters in use. The Directors desired to express their great regret for the loss of their late colleague and Chairman, Mr. J. Spencer Phillips, who died in May last, having been a Director since 1880, and Chairman since 1893. In moving the adoption of the report, the Chairman (Mr. T. F. Poole) said their meeting that day was overshadowed by the loss they had sustained by the death of Mr. Spencer Phillips. Before proceeding to propose the first resolution, he should like pay a tribute of respect to his memory. For 29 years as a Director, he gave them of his best, For sixteen years of this time as Chairman, his great ability was exercised in forwarding the interests of the Company. As a Board, they would greatly miss his counsel and his guidance. With regard to the report, it afforded them great pleasure to be able to submit so favourable a one, considering the difficult times through which they had been passing in connection with the coal crisis, and also the depressed condition of trade throughout the country—though in their more or less residential town they did not feel the effect of this general depression so much as those in manufacturing districts. For the fourth year in succession, they were able to pay the dividend of 5½ per cent., to which they were entitled under the sliding-scale, in spite of the fact that they were getting less for their residuals and that the price of coal was still considerably higher than it was a few years ago. Their business showed continuous improvement in every department. They had made 3½ million cubic feet more gas than last year out of 313 tons less coal, bringing the total make, for the first time in the Company's history, to over 200 millions. And so, with a somewhat reduced coal consumption, efficient production, and an increased consumption of gas, despite the poor return for residuals, their accounts showed a substantial surplus. They had entered into an arrangement with the Corporation to convert the existing gas-lamps to the incandescent system, and the work was in progress. Their excellent Manager (Mr. W. Belton) kept the works up to date and in a thoroughly efficient state of repair. The staff, also, under his direction, were thoroughly loyal to the Company. The profits had been more than sufficient to pay the full dividend. The report was adopted, the dividend recommended was declared, and votes of thanks were passed to the Chairman and Directors and the Engineer and staff. In reply to the latter, Mr. Belton referred to his association with the Company during the last thirty years.

Steady Progress at Tonbridge.

At the half-yearly meeting of the Tonbridge Gas Company on Monday last week, the Chairman (Mr. W. Judd), in moving the adoption of what he characterized as a very satisfactory report, said the period covered by it had been one of steady progress. The increase in the consumption of gas was 3 million cubic feet, or about 6 per cent., over the corresponding six months of last year; while the majority of gas companies had to be content with an increase of from 1 to 3 per cent. He thought these figures were of a very encouraging nature. The report stated that the works and plant had been maintained in a satisfactory condition; and he could assure the proprietors that this was a correct statement, and that everything possible was done to maintain and increase their efficiency. The extension of the main to Leigh had more than fulfilled the expectations of the Directors. The consumption in that village continued to increase, and a new consumer, taking 300,000 cubic feet per annum, had been added within the past few weeks. On the 1st of April the price of gas was reduced by 1d. per 1000 cubic feet, in the expectation of making a satisfactory contract for coal. This hope was fulfilled, and a further reduction of 1d. was made on the 1st of July; making the price 2s. 6d. There was hardly another town in the South of England with a similar population to Tonbridge where the price was so low. The shareholders must feel gratified, more especially as the result of a lowering of the price always was that the consumption increased. The receipts for gas were £305 more than before, notwithstanding the reduction. The revenue from the sale of coke was less, though a much larger quantity had been sold, due partly to the reduced price of coal. One of the most gratifying features of the accounts was the amount received for tar, which was very much in advance of previous years. The whole of the credit for this was due to the Secretary and Engineer (Mr. James Donaldson), who had taken considerable trouble in preparing the tar suitable for use on roads. They could have sold for this purpose more than double their make, and he thought more tar would be required in future for road-surfacing. He was very pleased to mention that the Directors had entered into a satisfactory contract for coal; and he thought that they might look forward to further increased consumption. The report was unanimously adopted. Mr. Lees proposed a hearty vote of thanks to the Directors, and also to the Engineer and Secretary, for the way in which the Company's business had been carried on during the half year. He said it was very gratifying to the shareholders to see the continued improvement in the Company, and also the further reduction in price. Mr. C. F. Catt, in seconding the motion, said the Directors and officials were to be congratulated on the way in which the Company's business was conducted. The motion having been carried unanimously, the Chairman replied for the Directors and himself, and Mr. Donaldson for the officials.

Prospective Further Extensions at Truro.

In the annual report of the Directors of the Truro Gas Company, reference was made to the fact that for several years the need of additional storage accommodation had been felt; and last winter, owing to the increased demand for gas, the difficulty became acute. Early in the year a tender was accepted from Messrs. Willey and Co., of Exeter, for the supply and erection of a gasholder of 100,000 cubic feet capacity; and this will be completed before the next winter's demand sets in. In view of further extensions, the freehold of some property adjoining the gas-works had been purchased. An issue of £3000 new 5 per cent. preference shares had been made and was considerably over applied for. The accounts showed a credit balance of £1917, and the Directors recommended payment of a dividend of 5 per cent.; leaving £152 to be carried forward. The Chairman of the Company (Mr. John James), in moving the adoption of the report and accounts at the annual meeting, remarked that the cost of coal had been reduced from £4197 to £3789 during the year, and the income from the sale of gas had slightly increased. They had not raised the price of gas when coal advanced so much. This had been to the advantage of the consumers; but the Company had had hard work to make any profit. Mr. J. P. Paull, in seconding the motion, referred to the use of tar for the roads, and expressed the hope that this residual would now become a more valuable product for the Company. The report was adopted, and the dividend recommended was declared; and thanks were accorded to the Secretary (Mr. W. H. Sainsbury), the Manager (Mr. S. J. Ingram), and their staffs. Mr. Ingram, in reply, said he considered the Company were in a very satisfactory position as the result of the past year's working. With the new gasholder which was being erected, they would get over the serious difficulty attending insufficient storage, and be able to store sufficient gas to meet 24 hours' demand.

Fair Trade and Dividend Maintained at Wolverhampton.

The accounts for the half year ended the 30th of June, which were presented at the ordinary general meeting of the Wolverhampton Gas Company last Tuesday, showed a net profit of £9095. This enabled the Directors to recommend the payment of dividends at the same rates as before—viz., 3 per cent. on the preference stock, £5 2s. 6d. per cent. on the consolidated stock, and £3 2s. 6d. per cent. on the new ordinary stock, less income-tax, and to carry to the reserve fund the balance of the excess dividend undivided, as authorized by the Act. They further recommended that £277 11s. 6d., interest for the half year, be placed to the credit of the reserve fund; £47 8s. 4d., like interest, to the credit of the insurance fund; and that the balance should be carried forward. The Chairman (Mr. B. O. Clark), in moving the adoption of the report, said the shareholders would see by the accounts that the profits made were not so great as they had been in previous years—not so great even as last year. The year's profits were down by £1400; but as the expenses were a good deal less, they were able to pay the same dividend as before. Everything with regard to the selling of gas had gone wrong, and trade generally had been bad.

However, the report, he thought, would show that the Company had done a fair trade. Mr. H. H. Ward seconded the motion and it was carried.

Water.

Large Capital Expenditure at Hawarden.

At the half-yearly general meeting of the Hawarden Water Company on the 28th ult., the Directors reported a balance of £1238 available for distribution; admitting of the payment of a dividend at the rate of 3 per cent. per annum, free of income-tax, and the carrying forward of £537. The Engineer (Mr. W. Simmons) reported that during the six months ended the 30th of June water had been laid on to 116 houses, bringing up the total to 3626; the estimated population being about 18,130. The trade consumption, registered by meter, was 5,038,000 gallons. The reservoirs and mains were in good order; and the construction of the new storage reservoir at Cilcain would probably be completed before the end of the year. Work was in progress on the foundations for the filtration plant, which it was hoped would be in operation some time in October. The Chairman (Mr. James Tomkinson, M.P.), in moving the adoption of the report, said the income of the Company had increased, compared with the corresponding half of last year, by £98; but the expenditure had risen in a rather larger degree—viz., by £108. The net result was that the £1176, which was the balance of profit over expenses (compared with £1186), was equal to a dividend of 4½ per cent. on the total paid-up capital of £44,740. It might occur to some shareholders to ask how it was that, having earned 4½ per cent., the Directors only proposed to distribute 3 instead of 3½ per cent., which had been the usual steady level of dividend for some years. The fact was they had had to undertake a large capital expenditure. They were making a fine new reservoir to hold 20 million gallons, which would be one-and-a-half times as large as the whole of their storage at the present moment. They were also installing filtration plant at a cost of £1400; and they had laid a large and costly main. All this very heavy capital expenditure it was impossible to repay out of profit. They therefore hoped the proprietors would take up something like £4000 worth of shares, which would be offered to them at a discount. He thought they would be a very good investment, in view of the present position and prospects of the Company. The business was certainly progressive; and very shortly now, with their completed reservoirs and extended neighbourhood, they ought to reap the full benefit of the large expenditure they had made. The report was adopted, and the dividend recommended was declared.

CO-PARTNERSHIP AT WESTON-SUPER-MARE.

At the recent half-yearly general meeting of the Weston-super-Mare Gas Company, the Chairman (Mr. H. F. Price) said the most interesting feature in the Directors' report was the co-partnership scheme which had been introduced, and of which the following were the chief points: (1) To set aside a sum by way of bonus equal this year to £2 10s. per cent. on the earnings of all employees who sign agreements, and thus become partners. (2) This bonus will be increased ⅜ per cent. for every 1d. reduction in the price of gas, or decreased by the same amount in the event of a rise in price. (3) The bonus will be paid to Trustees for the co-partners, and by them placed to the credit of each co-partner, according to his earnings. (4) One-half of each man's share will be placed to an investment account for the purpose of buying (when a sufficient amount) ordinary stock in the Company, and the other half to a withdrawable account; in both cases bearing interest at 4 per cent., until invested in stock. A co-partner may add to his investment or withdrawable account from other sources, and so become entitled to purchase stock at an earlier date than he otherwise could. The scheme, the Chairman added, was based on the Croydon plan, but adapted to suit local conditions. The cost was estimated at not more than £150 per annum on the present business. The Directors were satisfied that the adoption of the scheme would be very much to the advantage of the Company. The scheme was unanimously approved and adopted.

SOUTH STAFFORDSHIRE WATER COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, in Birmingham, last Tuesday—Alderman C. G. Beale in the chair.

The Directors reported that the number of houses laid on during the half year ended June 30 was 928; making the total supplied 136,970. The gross amount of water-rates for the half year was £73,251, against £71,955 in the corresponding period of the previous year. They had transferred the sum of £1000 to the depreciation fund; thus raising it to £31,220. After providing for interest on the debenture stock and the dividend on the preference stock, the amount remaining for distribution (including £7806 brought forward) was £29,041. The Directors recommended the declaration of a dividend for the half year on the ordinary stock at the rate of 6½ per cent. per annum, less income-tax. The amount of this dividend being £20,984, there would remain £8057 to the good. The Directors added that the Company's Bill for confirming the pumping-stations erected during recent years and for sanctioning a new station at Maple Brook had passed; and, in common with other water undertakings applying for similar confirmation, the Company had had to accept very wide obligations as to compensation for drainage where it could be shown to have occurred, and concessions had to be made to Local Authorities opposing the Bill. These obligations did not directly affect the revenue for the past half year; but, in anticipation of their future effect (the extent of which could as yet only be estimated), they had thought it prudent to make reserves in certain directions, and to strengthen the contingent fund.

The Chairman, in moving the adoption of the report, said the past half year had been a very eventful one, and one not without serious anxieties. The Company had had to go to Parliament, and had had a strenuous time; but they had come out with what they wanted, though they had had to concede somewhat onerous terms in order to succeed. Referring to the revenue account, water-rates had gone up £1296, due in the first instance to an increase of £1048 in domestic charges, and £248 in meter charges. The latter was due chiefly to public purposes and buildings, and not to private supplies, as the latter had gone down by about £75; showing that at present they had not felt any revival of trade in their district leading to a removal of the depression they had experienced in their charges for some time past. Rates had gone up by £198. His predecessor always had something to say about the rates; and he (the speaker) could not look at them in a more cheerful light. They were always going up. It was due to a slight increase in the assessment and in the poundage. Incidental expenses had gone down by £461; while current law charges had gone up by £562. They had added £1000 to the depreciation fund—a thing which they were not at all accustomed to do at this period of the year. Then there was the serious matter with which they had been faced during the past half year. He need not tell them why they went to Parliament. They found themselves, under a decision of the Court of Appeal, in this position—that every one of the pumping-stations they had erected since 1875 was declared to be *ultra vires*; and the Company were liable to be attacked on all sides for having taken water out of the ground which they had no right to take. They were, in fact, attacked immediately. The Kingswinford District Council, and another on the Lichfield side, commenced proceedings against them for injunctions. These actions were undefended, for they could not see what could be gained by going on with them; and though they told these authorities they were applying to Parliament for sanction for all these works, and the authorities themselves, when they got to Court, said: "We do not ask you to stop the works, and we quite agree the injunctions can be suspended until you have been to Parliament," they went on, and put the Company to the increase of £500 odd to which he had referred. He was, and had been all along, utterly unable to see what was to be gained by such action. All that could be said was that there was a nice little dispute in the Chancery Court, which did nobody any good. The Company went to Parliament in this position. The injunctions were granted; and the Court held them over so that the Company might put themselves right by going to Parliament. They were not the first Water Company to go to Parliament this year. The original victims were the Frimley and Farnborough Company; and Parliament put upon them very stringent clauses giving compensation to landowners whose water supplies and wells had been drawn upon by the operations of the Company. It was obvious that the South Staffordshire Company were not going to escape a similar liability, and they had 29 petitions against their Bill, the majority being on the question of compensation. The Company faced the position immediately, and offered a very full compensation clause to those landowners and others who alleged they had been drained. In many instances it was accepted, but not in all; and when they got to Parliament they found themselves opposed by five or six owners of water supply, who claimed they had been, or would be, damaged by what the Company were going to do. It was quite clear their policy was to show the Parliamentary Committee that they were quite prepared to meet all the claims in a fair and reasonable way. They succeeded in this, because there was not, from first to last, a word of suggestion that they were not acting in a fair and reasonable manner towards those who had made claims. This was proved by the fact that ultimately only one of their opponents had to take the decision of the Committee. The shareholders would no doubt ask how this was going to affect the future of the Company. He would place the facts before them, and they must draw their own inferences. The Chairman then went in detail into the various points connected with the parliamentary proceedings, and concluded by saying that the general effect of the compensation clauses in the Act was that where a landowner or occupier could show, or raise an unmistakable presumption, that they had drawn by their pumping operations on his well or water supply, they must, as nearly as possible, put him in his original position free of cost. The Company paid in water if they could; if not, they paid him compensation in money. It was probable that in most cases they would be able to pay in water instead of in money. As to the future of the Company, all he would say was that he should be very much disappointed if they had to reduce the dividend lower than it was this half year. The Directors would do their best to maintain the dividend at what it stood at now, and hoped the increase in the population of the district, and the possible revival in trade, would soon enable them to revert to their old position.

Mr. F. H. Lloyd seconded the motion; and it was carried unanimously.

The dividend recommended was declared; and the proceedings closed with a vote of thanks to the Directors.

BARNET DISTRICT GAS AND WATER COMPANY.

Increased Sales of Gas—Difficulty in Obtaining Further Water.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Holborn Restaurant, W.C.—Mr. Arthur F. Phillips, M.Inst.C.E., in the chair.

The Secretary (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the Directors' report (which was noticed in last week's "Journal," p. 594), and the statement of accounts, were taken as read.

The Chairman, having mentioned that both Mr. A. H. Baynes and Dr. J. W. L. Glaisher were away taking a needed rest, said that, as he felt bound to take the proprietors through other important matters, he did not propose to go, in detail, over all the figures. They indicated an improvement in the results attained, and an extension of the business. The expenditure on capital account was, on the gas undertaking, £3312, and on the water £4553, which was practically all for extensions of mains. For the gas undertaking, there had been laid during the half year 6312 yards of main, varying from 4-inch to 14-inch, resulting in a net increase in the length of mains equal to 4697 yards; for the water, 10,491 yards, varying from 4-inch to 16-inch, had

been laid, resulting in a net increase of 8228 yards. The extension of gas and water mains, after allowing for replacements, was 12,925 yards, or (say) 7½ miles. This, with a small amount for meters, accounted for the capital expenditure. The gas revenue showed a net increase in the receipts of £979; while the expenditure increased £450—resulting in a profit of £529 more than in the corresponding previous half year. The expenditure on distribution showed an increase of £974, for which the repairs of mains and meters were answerable. The meters were all being examined. The water revenue was £994 more; while the expenditure had increased by £1072—resulting in a decrease in the profit of £78. The increase in expenditure was chiefly due to mains. It had been necessary to make considerable alterations owing to the extension of the tramways; and while the bulk of the expenditure had been repaid by the County Council, there were many alterations made and services relaid which it was not advisable to charge to capital, and of which revenue had had to bear the cost. There was an increase in the sale of gas of 4,953,000 cubic feet, equal to 7·84 per cent., when compared with the corresponding half year; and this was highly satisfactory in these days of keen competition with the electric light and the reduced consumption of gas consequent on the extended use of more economical burners. It was evidence that their officers were looking well after the business. The gas manufactured per ton of coal was 11,656 cubic feet, which was 454 cubic feet more than in the previous half year. The quantity sold was 10,783 cubic feet per ton; the amount unaccounted for being 7 49 per cent. This was more than it should be; but he might remind the shareholders that the Company had a considerable mileage of mains, some of which were old. They were being examined; and the Engineer reported that he was finding many small leaks. The fuel consumption on the gas-works was 17¾ per cent. During the half year new services were laid to 148 ordinary and 173 prepayment consumers—making a total of 321, and bringing the number of gas consumers up to 4944. The new water-services laid during the six months numbered 356. The quantity of water supplied to the district was 303,916,000 gallons, or 33,472,000 gallons less than in the corresponding period—a result reflecting credit on the management, showing that the waste of water was receiving attention. There was a reduction in pumping charges from £1839 to £1498, due to less water having been pumped, and to using as far as possible the pumping-stations which were the most economical in working. The profit from the gas undertaking was £3368, from the water supply £9399, and from fittings £94—together £12,861. Interest and income-tax absorbed £2221, and the dividends proposed £9889—leaving a surplus of £751. But as £1000 had been transferred to the contingency fund, it left a balance to carry forward of £17,687, against £17,936 at Christmas last. In the report there was an unpleasant paragraph, on which the proprietors might desire further information. It was well known that year by year the level of the water at the Company's pumping-stations continued to permanently fall, while at the same time the district continued to develop and the demand for water to increase. Considering the wells were on the high ground, that clay overlaid much of the chalk, and that there were also wells of the Metropolitan Water Board pumping substantial quantities of water, this result was not surprising. To the Directors, however, it caused the greatest anxiety. It was ever uppermost in their minds, and was always under consideration. Water must be obtained to meet the demands of the immediate future. Considerable sums were spent in seeking additional supplies; and the most eminent engineers and geologists had been consulted. In these endeavours to obtain the first necessary of life, and to comply with the statutory obligation laid upon the Company, nothing had been done without the most mature consideration. In 1904, the Company promoted a Bill in Parliament to authorize the sinking of a well at Bayfordbury, in the valley of the Lea, which was outside the Company's limits, and the construction there of a pumping-station, with the necessary main to conduct the water into the Company's district. The Bill was strongly opposed by the Hertfordshire County Council, the Metropolitan Water Board, and the territorial magnates. It passed the Commons; but in the Lords the part of the Bill authorizing the Company to go to Bayfordbury was struck out. The opponents alleged that the Company had not exhausted the supplies which could be obtained within their own limits. They had hanging on the wall a large map showing a site at Tyttenhanger (which was within the Company's limits), where it was considered water could be obtained. The Directors were aware of this; but the distance was considerable, and it was doubtful if the quantity required would be obtained. In view of the great expense the Company had incurred, and the urgent necessity of providing for their district, the suggestion was accepted. As the Company did not own the land, and no powers to purchase had been taken, it was not possible to definitely authorize in the Bill a pumping-station at Tyttenhanger; but the Committee, after much discussion with the opposing Counsel, gave a special clause which was considered sufficient to enable the Company (if the land could be purchased by agreement) to erect a pumping-station there. This clause (10) in the Company's Act of 1904 was so important that he would quote it:

> The Company may by agreement purchase, take on lease, or acquire and hold for the purposes of the water undertaking (in addition to any lands by the Acts of 1872, 1883, and 1887, or any of them, authorized to be purchased, and the land in the parish of Shenley within the limits of deviation delineated on the deposited plans) any lands within the limits of supply not exceeding in the whole 15 acres, and may on all or any of such lands execute for the purposes of, or in connection with, the water-works any of the works and exercise any of the powers mentioned in, or conferred by, section 12 of the Water-Works Clauses Act, 1847.

To show the importance of these last words, he must read one of the provisions of section 12 of the Water-Works Clauses Act of 1847:

> They may from time to time sink such wells or shafts and make and maintain, alter, or discontinue such reservoirs, water-works, cisterns, tanks, aqueducts, drains, cuts, sluices, pipes, culverts, engines, and other works and erect such buildings upon the lands and streams authorized to be taken by them as they shall think proper for supplying the inhabitants of the town or district within the prescribed limits with water.

Surely this clause meant something; and if it had any meaning, it was that if the Company acquired the land within their own limits, they had the right to sink there a well for supplying water to their district. He was present in the Committee-room when the clause was settled, and had a clear recollection of the discussion which took place between the Counsel engaged and the Committee. He had no hesitation in saying the clause was given with the intention of authorizing the Company to erect the pumping-station, provided the land could be purchased. The reason for the clause would be found in the notes of evidence—"That they were content, having regard to the particular circumstances of this case, and to the undoubted want of water." Counsel representing the Hertfordshire County Council and the territorial opponents "accepted it, in regard to the special circumstances of the case." The only restriction put upon the Company was that the pumping should not be in Middlesex. It followed that the Committee and all the Counsel agreed and expected that the Company would at once endeavour to purchase land in Hertfordshire within their own limits, and erect a pumping-station. To suppose the clause was only given to enable the Company to make additions to their existing works, was to assume that the Committee were devoid of common-sense, because the Company had proved in evidence to their satisfaction that no more water could be obtained from the existing pumping-stations. As soon as the Bill became an Act, the Directors, considering that the Company's powers ample, took steps to acquire certain land at Tyttenhanger; and after having put down a boring and ascertained that there was an abundant supply of water, plans and specifications were prepared and a contract was entered into for constructing the pumping-station. After considerable progress had been made, the Directors were surprised to receive a letter from the Solicitors of the Marquis of Salisbury, requesting the Company to desist from sinking the well, and stating that, unless this was done, an application would be made to the High Court of Justice for an injunction. The Company naturally replied that they were sinking the well under the powers contained in their Act of 1904; but notwithstanding this, action was taken against the Company, and the Directors were surprised that the injunction was granted, and the work had to be stopped. He must here digress a little for the sake of those proprietors who were not well informed on all that took place with regard to water supply. Water companies having in their Acts the ordinary power to purchase land within their limits and on it construct works for the purpose of the undertaking, had always considered this sufficient authority to sink wells and construct pumping-stations. Many works had been erected all over the country under such conditions, including some by the late London Water Companies. Some three or four years ago, the Frimley and Farnborough District Water Company sank a well under these conditions, when the High Court ruled that the power to acquire additional land for the purposes of the undertaking did not authorize the construction of a new pumping-station. He believed it was the decision in this case that led to the injunction being applied for against the Company's work at Tyttenhanger. The position was, however, not the same, because the Frimley Act did not contain the special proviso that on such land they could exercise all or any of the powers contained in section 12 of the Water Works Clauses Act, 1847. The Directors considered it a hardship in 1904 that, while the Metropolitan Water Board were allowed to pump from the Lea Valley vast quantities of water (he believed it was nearly 30 million gallons per day in 1907-8), the Barnet Company could not have a few million gallons for the supply of their district, mostly in Hertfordshire. The position was still worse when they were prevented from pumping water which was in their district—the principal reason assigned being that it might affect a small well 1¾ miles away, which supplied the village of Hatfield. This well and all the works connected with it were carried on without statutory authority of any kind. The Barnet Company did not desire this water supply as a source of profit. The dividends paid to the proprietors had been kept down for years, in consequence of the costs that had been incurred in endeavours to obtain water. The Company must have water to fulfil their statutory obligations. It was vital to their existence; and this was the only position within their limits where there was a probability of obtaining it. The Company had no desire that anyone should suffer injury from the proposed works at Tyttenhanger. The fear of affecting the well at Hatfield was most remote; and the other well mentioned in the case, at Essendon, could not possibly be affected. It was a small tube sunk by the side of the River Lea in a different watershed 5 miles away. As he previously remarked, the water-works at Hatfield existed without statutory authority; and they were stated to be a source of considerable profit. It seemed unreasonable that the inhabitants of an important and growing district like Barnet should be deprived of a supply of water which rightly belonged to them for mere sentimental reasons attaching to the Hatfield well. The Board held in the very highest estimation the Most Honourable Marquis at whose instigation these proceedings had been taken; and they deeply regretted the expense he might have been put to and the very large expense the Company had incurred, as well as the further costs in which they would be involved. But they feared he had been unfortunately advised. They were of opinion that, under their Act, they had the right to take water at Tyttenhanger; and as, according to an old proverb, "He who exercises a right does no one an injustice," the Directors would endeavour by every lawful means to secure the rights they believed Parliament intended they should possess. There was no alternative. They must have the water; and, having already spent considerable sums in obtaining the Act, the purchase of the land, and the sinking of the well, the interests of the proprietors demanded it. He concluded by moving the adoption of the report and accounts.

Mr. Alfred Lass, F.C.A., seconded the motion.

Mr. W. B. Bryan thought the Directors were right in appealing. The interim injunction was granted without hearing them; and he was quite of opinion that on appeal they would win. The cases in which injunctions had been secured were on a different footing, for there was not the special proviso that was in the Barnet Company's Act. Anyhow, he was sure if they went before a Parliamentary Committee and explained everything there, they would get their Bill.

The Chairman remarked that at present they hoped to get Tyttenhanger. If they failed, they would have to look out for another source. They must go outside their limits.

The resolution was then carried unanimously.

Proposed by the Chairman, and seconded by Mr. Frederick Lennard, dividends were declared for the half year, less income-tax, at the rates of 7½ per cent. per annum on the "A" and "C" stocks,

6½ per cent. per annum on the "B" stock, and 5¼ per cent. per annum on the "D" capital gas and water stocks.

Mr. JAMES L. CHAPMAN, Assoc.M.Inst.C.E., in moving a vote of thanks to the officers, said the balance-sheet showed that both departments of the undertaking had been excellently worked. There was a high make and sale of gas, a low percentage of fuel used, a good quality of tar sold, and a large amount of sulphate of ammonia made; and when they looked at the effect of all this on the accounts, they would agree with the vote he proposed to the Engineer and Manager (Mr. F. J. Bancroft, M.Inst.C.E.), Mr. Drew, and Mr. Wright.

Mr. LASS seconded the motion, which was heartily carried.

Mr. BANCROFT, in acknowledgment, said that, as the shareholders would have gathered, from the remarks of the Chairman, the Company had had a strenuous time; but they had a staff who were working loyally and well, both for the benefit of the proprietors and to give satisfaction to the consumers.

Mr. DREW and Mr. WRIGHT also briefly replied.

Mr. F. R. SMITH proposed a hearty vote of thanks to the Board—and more especially to Mr. Phillips for the able and exhaustive report he had given them on the water question. It was not often, he remarked, that a Board took the proprietors so fully into their confidence as Mr. Phillips had done; and he was sure they all appreciated the time and trouble be had given to the matter. He hoped the result of the appeal which had been referred to would be to vindicate the position of the Company.

Mr. C. A. BANNISTER seconded the resolution, which was unanimously passed.

The CHAIRMAN, in returning thanks, remarked that the position of the Company just now was an exceedingly trying one, and required a great deal of time and attention on the part of the Board. But they hoped for success.

THE GAS PROBLEM AT SALFORD.

The Supply to Consumers in Out-Districts.

Considerable discussion took place at a Meeting of the Salford Town Council last Wednesday on the following resolution submitted by Alderman Phillips, the Chairman of the Gas Committee: "That the Council be recommended to authorize the Gas Committee to enter into negotiations with the out-districts with regard to the supply of gas; and, in the event of a reasonable understanding not being attainable, to intimate that the Council will seek relief from the obligation to supply." This was the resolution adopted at a special meeting of the Gas Committee held the previous evening, and confirmed later by the General Purposes Committee of the Council.

In moving the resolution, Alderman Phillips said it must be recognized that the gas undertaking at Salford existed primarily for the benefit of the inhabitants of the borough, and only secondarily for the supply of consumers in the out-districts. For a long period they had not had a particularly happy time with the out-districts, although concession after concession had been made to them. To-day, Eccles and Swinton were being supplied with gas at the same figure as the inhabitants of the borough itself, and Worsley and Barton at a price only 2d. per 1000 cubic feet above that charged in Salford. Barton was very sparsely populated—only one person to the acre; and no profit had ever been made out of the supply of gas to the district. In fact, these out-districts were enjoying a convenience at the expense of the ratepayers of Salford. Notwithstanding this, whenever the Corporation went to Parliament with a Bill which included gas clauses, necessitated by the growth of the undertaking, the out-district authorities opposed them, with the object of getting further concessions. There was opposition in 1897; but it was settled by the Corporation granting terms which they thought would be satisfactory. But when the Corporation again went to Parliament this year, there was opposition once more from the out-districts; and the decision of the Committee of the House of Lords was so inimical to the interests of Salford, that the Bill was withdrawn. If the decision had been accepted, it would have practically taken away the Corporation's power to make a profit out of the gas undertaking—a result which would have placed the ratepayers in a serious position. It cost the Corporation now more to supply gas to the out-districts than to the borough itself; and the time had arrived when there must be a limit to the concessions. These districts were not only dependent upon Salford for gas, but for trams, the treatment of infectious diseases, and other advantages, including the education of technical students. If they would not agree to reasonable terms, there was no alternative but for Salford to seek relief from the obligation to supply them with gas, and leave them to take their affairs into their own hands.

The resolution was carried unanimously.

Arrangements are being made for a conference of representatives from the various authorities affected by the resolution. The Clerk to one of the District Councils concerned says it raises a new issue; and he expressed the opinion that the Corporation cannot refuse to supply the districts with gas until some other provision has been made. It is recalled, in connection with this dispute, that when Salford sought powers, in 1891, to raise fresh gas-works capital, Eccles and Swinton were empowered to promote, within two years, a Bill to erect gas-works and to purchase the portion of the undertaking of the Corporation affecting these districts. In 1892, Swinton promoted a Gas Bill; but Eccles did not join. The Salford Corporation opposed the Bill, on the ground that the power given was a joint one which could only be exercised by the two authorities in combination; and in consequence of the former not having joined, the Bill was thrown out.

At Pulborough, Sussex, a new water company is in course of formation, and it is proposed to issue £1 shares. The cost of the scheme is estimated to be something like £3000; and it has been recommended to sink an artesian well 250 feet deep in a field near the railway station.

THE PROPOSED NEW GAS-WORKS FOR BELFAST.

Negotiations with the Harbour Commissioners.

The Gas Committee of the Belfast Corporation recently had a meeting at which a good deal of discussion took place in regard to the proposed new gas-works; and the Committee considered in detail the estimates of the value of the sites and surface levels, with the capitalized value of the cost of the carriage of coal for thirty years—this information, as already reported (*ante*, p. 531), having been prepared by the officials concerned. Several questions were asked by various members as to the mains, plant, residual product works, and other points; and these were answered by the City Surveyor (Mr. H. A. Cutler) and the Gas Engineer and Manager (Mr. Robert Sharpe).

It appears that no definite decision was arrived at as to the merits of the different sites offered; but, on the suggestion of the Chairman (Mr. J. A. Doran), it was resolved that the Belfast Harbour Commissioners should be asked for replies to the following questions in relation to the site on their property: (1) In the event of the Corporation selecting a site for new gas-works on the harbour property at the East Twin Island, will the Commissioners oppose or assist the Corporation in obtaining the necessary parliamentary powers? (2) Will the Commissioners confirm the offer of their Works Committee of Nov. 9, 1908—viz., £750 per acre for a site of 36 acres? (3) Will the price of land include all necessary wayleaves for the gas-mains, &c.? (4) Who will maintain the present embankments and pitching during the construction of the gas-works and afterwards, including the land on the water sides of the proposed site reserved by the Commissioners on the Musgrave and Victoria Channels? (5) Who will make and maintain approach roads? (6) In the event of the Harbour Commissioners changing the position of any road or street, or in the event of subsidence occurring in any road or street through which gas-mains are laid, who will pay cost of alterations and repairs to mains? (7) Will the Commissioners extend the water-main to the proposed site, to provide a water supply from the Water Commissioners' mains? (8) Will the Commissioners provide for drainage? (9) In the event of the Gas Committee taking the site, will any conditions be imposed by Harbour Commissioners?

On the suggestion by a member of the Committee, it was agreed to add the following question: If the site on the East Twin Island be not adopted, will the Harbour Commissioners let a site for a jetty for unloading coal for the exclusive use of the Corporation? If so, where, and at what cost? It was further decided to submit the following additional queries: Are the Harbour Commissioners willing to enter into a contract for the discharge of coal from vessels into lighters or waggons? If so, at what price per ton? In the event of coal being conveyed by the Corporation tramways from the harbour to any site, would there be any charges by the Harbour Commissioners? If so, what, (*a*) in the event of the Harbour Commissioners renting an exclusive site for unloading, and (*b*) in the event of no exclusive site being allotted?

The further consideration of the question of the site for the new works was adjourned.

NORTHAMPTON WATER-WORKS EXTENSIONS.

Local Government Board Inquiry.

Last Thursday, Mr. M. K. North, M.Inst.C.E., held an inquiry, on behalf of the Local Government Board, at the Northampton Town Hall, into an application by the Corporation for sanction to borrow £6600 for purposes of water supply, including the construction of a service reservoir at Boughton. The Town Clerk (Mr. Herbert Hankinson) stated that the Corporation had purchased 11 acres of land at Boughton in 1901 for the reservoir; but, as there was then no immediate necessity to proceed with it, the matter had remained quiescent until comparatively recently. Of late, however, it had become advisable to increase the pressure and the supply to the high-level district of the town, which, in spite of the Corporation's legal obligation, was not at present adequate. Additional high factories had been erected during recent years, which he thought were not under contemplation at the time the site for the reservoir was acquired. Owing to special circumstances, the Board had sanctioned the acceptance of a tender for the pipes, &c., before sanction was given to the loan. The estimate for the mains was £2529; and the figure still held good. The estimate for the covered service reservoir was £4070; but the actual lowest tender was for £4365, and it had been accepted. It therefore became necessary to amend the application to the extent of the difference in the amounts, strictly speaking from £6600 to £6900. A formal resolution of the Council would be forwarded in due course. The Water Engineer and Manager (Mr. Frank Tomlinson) stated that a portion of the work had been carried out. The Inspector inquired why it had been begun in anticipation of sanction. The Town Clerk explained that the Corporation were hoping that the inquiry would have been held in July; and they wrote asking the Board to so arrange it. But this did not turn out to be feasible; and the matter was deemed of such urgency, and the pipes had already been purchased, that it was proposed to carry out that part of the work. When it was found that the inquiry would be further delayed, it was felt that the only satisfactory way would be to go on. Mr. Tomlinson pointed out that the work could not be carried out later in the year. The Town Clerk asked that the loan might be spread over a period of 35 years. A detailed statement in regard to the plans was then given by Mr. Tomlinson; and as there was no opposition, the inquiry closed, and the Inspector paid a visit to the site.

The Metropolitan Private Water Supply Syndicate, Limited, has been registered with a capital of £1000, in £1 shares, to carry on the business of consulting, civil, electrical, and general engineers, contractors, well sinkers, and water-supply engineers and contractors. One of the first Directors is Mr. Eardley Bailey-Denton. The offices are at No. 62, King William Street, E.C.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The projected gas legislation for Glasgow was foreshadowed in the "Glasgow Herald" of Wednesday, in an article in which it was stated that the proposed new Provisional Order for the consolidation of the local Acts of Parliament relating to the Glasgow Corporation's gas undertaking had been before a Joint Committee of the Parliamentary Bills and Gas Committee, who recommended to the Corporation its adoption, and also that a conference should be held with the Scottish Office in regard to the suggestions made in it as to the sinking funds. New provisions or amendments on other existing provisions in the local Acts have been introduced in the new Order. Regarding the price, it is proposed to introduce in the Order the provisions now usually inserted in all Gas Acts with regard to the charges for gas, whether for public or private purposes, whereby all consumers in the same circumstances, and requiring the same extent of supply, will be supplied on the same terms and conditions; and the Corporation will also be empowered to make special contracts or agreements with persons requiring a special supply. It is proposed to re-define the city supply district (referred to in the Act of 1891) so as to include all places and districts entitled to be supplied at city rates, and to enact that all districts beyond the city supply district and within the limits of supply of the Corporation shall be designated the supplementary supply district, in which a differential rate may be charged. It is proposed to include within the description of the gas lands all ground which the Gas Engineer considers is required for the manufacture and storage of gas or residual products, and to give the notice required by the Standing Orders of Parliament in connection therewith. At present, the Corporation have power to reduce the quality of the gas to 16 candles. It is proposed to take permissive power in the Provisional Order to reduce the quality to 14 candles, as has recently been done in a number of Gas Acts obtained by other municipal corporations and private companies. A clause is suggested that fittings, engines, &c., hired out by the Corporation are not to be subject to the landlord's hypothec, though fixed to the premises supplied with gas, but are to remain the property of the Corporation. Power is also to be sought to require the use of anti-fluctuators for gas-engines driven by gas supplied by the Corporation. It is suggested that it would be expedient to unify the various sinking funds now in operation in connection with the Gas Department by equating the periods within which the various amounts authorized to be borrowed fall to be repaid, so as to make one period for the whole. It is also suggested that the present sinking fund of 1½ per cent. on £1,000,000 (being the estimated capitalized value of the Corporation gas annuities in 1901) should be hereafter calculated upon the present capitalized market value of these annuities, so far as not redeemed, which is estimated at £590,877. These suggestions are made, subject to the proviso that the same, if given effect to, will not involve a large increased payment in respect of sinking fund.

The accounts of the Aberdeen Corporation Gas Department for the year ending July 31 have been issued. They show a total revenue of £122,637—an increase of £1453 over the previous year. Gas and meter-rents produced £95,101, made up as follows: Ordinary consumers, £76,645; motive power, £6809; prepayment meters, £11,536; and meter-rents, £29. Residual products realized £24,808; house services, £1178; gas-stoves, £1416; and rent and feu-duties, £129. The expenditure amounted to £99,884—a decrease of £5579. The balance carried to net revenue account was thus £22,753. A year ago it was £15,720. The cost of coal was £54,976, as compared with £66,698. Oil and coke for carburetted water gas cost £5431, and purifying materials £1401. Salaries of the Engineer, Analyst, and officers at the works amounted to £958, and wages of stokers and labourers to £11,963. Maintenance of works cost £1051, and of plant £4539. The total expenditure on the manufacture of gas was £80,977. Distribution cost £4229. House services cost £1263. The outlay upon gas-stoves was £1693, and wages and other expenditure amounted to £921; while £772 was written off as depreciation. Rents, feu-duties, and taxes amounted to £5271. Management cost £1928; the general charges came to £887; and discount and bad debts to £3871. The charge for annuities was £4105; and interest on mortgages, bank accounts, and reserve fund amounted to £4080. The sum placed to sinking fund for the redemption of mortgages amounted to £10,004; and for the redemption of annuities to £650. The contribution to the reserve and insurance fund was £300. A sum of £3000 has been placed to the renewal fund; and a balance of £612 is carried forward. The general balance account shows the amount expended on works to have been £443,027; and with funds and stocks on hand this sum is raised to £470,223. During the year 67,851 tons of coal were carbonized, from which 694,487,000 cubic feet of gas were made. With 81,675,000 cubic feet of carburetted water gas, the total quantity of gas made was 776,162,000 cubic feet. The gas accounted for was 729,881,000 cubic feet, and unaccounted for 46,281,000 cubic feet, or 5·96 per cent. The gas-rental was £95,101. The price per 1000 cubic feet was 2s. 7d. to ordinary consumers and 2s. 4d. for motive power. Bad debts amounted to £332. On Wednesday, the Gas Committee had before them the estimates for the current year. The revenue from gas is estimated at £92,813, and from residual products at £23,930—a total of £116,743. The expenditure is estimated at £120,003. Taking into account a sum of £3399 at credit, the estimates bring out a surplus of £139. Last year the expenditure was estimated at £122,025. The Committee agreed to recommend that the price of gas to ordinary consumers be reduced from 2s. 7d. to 2s. 6d. per 1000 cubic feet, and to users for motive power from 2s. 4d. to 2s. 3d.; also that prepayment meter consumers should receive 29 cubic feet for 1d., instead of 26 feet as at present.

In view of the movement for a gas transfer at Carnoustie, which has now reached the stage of the taking of a plebiscite of the ratepayers, there was more interest than usual in the statement submitted by the Directors of the Carnoustie Gas Company to the shareholders at their fifty-fourth annual meeting on Wednesday, at which ex-Provost Ramsay presided. The balance-sheet and profit and loss account for the year to Aug. 4 were submitted and approved of. The net profit was £675, out of which a dividend at the rate of 7½ per cent. was declared, which

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 623.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17¾—18¼	..	5 9 7
298,955	10	,,	7	Do. 7 p.c.	12½—13	..	5 7 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd.. . . .	5⅝—5⅞	..	5 10 8
40,000	5	,,	6½	Do. New, £4 paid.	4½—4¾	$+\frac{1}{16}$	5 9 6
50,000	10	Aug. 26	15	Bournemouth Gas and Water 10 p.c. . .	28—28½*	..	5 5 3
311,810	10	,,	7	Bournemouth Gas and Water B 7 p.c. .	16¼—16¾*	..	4 3 7
75,000	10	,,	6	Bournemouth Gas and Water Pref. 6 p.c.	15⅜—15⅞*	..	3 16 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	250—253	..	4 18 10
300,000	,,	,,	9½	Do. New . . .	190—192	..	4 19 0
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122	..	4 2 0
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	100—102	..	3 18 5
220,000	Stk	Mar. 12	11†	Brighton & Hove Orig.	213—215	..	5 2 4
246,320	,,	,,	8†	Do. A Ord. Stk. .	154—156	..	5 2 7
460,000	20	Apl. 16	10	British	43—43½	..	4 11 11
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c. . .	117—119*	..	5 0 10
165,700	,,	,,	4½	Do. B 3½ p.c. . .	88—90*	..	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c. . .	106—108*	..	5 1 10
5?,000	,,	June 25	3½	Do. 3½ p.c. Deb. .	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13¾—14¼	+¼	4 18 3
250,000	Stk.	June 25	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord. . .	106½—108½	..	4 12 2
1,493,280	Stk.	Aug 26	$5\frac{2}{10}$	Commercial 4 p.c. Stk. .	107—109*	..	4 15 5
560,000	,,	,,	5	Do. 3½ p.c. do. .	103—105*	..	4 15 3
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	95—97	..	5 3 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
493,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord. .	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd. . . .	24½—25	..	4 16 0
354,060	10	,,	12	Do. £7 10s. paid.	18½—19	..	4 14 9
15,141,545	Stk.	Aug. 12	4⅔	Gas light and Coke 4 p.c. Ord. . .	104—105	..	4 8 10
2,600,000	,,	,,	3½	Gas light and Coke 3½ p.c. max. . .	87—89	..	3 18 8
3,799,735	,,	,,	4	Gas light and Coke 4 p.c. Con. Pref.	103—105	..	3 16 2
4,193,975	,,	June 11	3	Gas light and Coke 3 p.c. Con. Deb.	86—87	+½	3 8 11
258,740	Stk.	Mar. 12	5†	Hastings & St. L. 3½ p.c.	93—95	..	5 5 3
82,500	,,	,,	6½†	Do. do. 5 p.c	118—120	..	5 8 4
70,000	10	Apl 29	11	Hongkong & China, Ltd.	17¾—18¼	..	6 0 7
131,000	Stk.	Mar. 12	6½	Ilford A and C . . .	141—143	..	4 10 11
65,780	,,	,,	5	Do. B	106—108	..	4 12 7
65,500	,,	June 25	4	Do. 4 p.c. Deb. . . .	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental .	179—181	..	4 8 5
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 11

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest ment.
£			p.c.				£ s. d.
195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c. .	118—120*	..	5 0 0
561,000	Stk.	,,	10	Liverpool United A .	223—225*	..	4 8 11
718,100	,,	,,	7	Do. B . .	64½—166½*	..	4 4 1
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean.	4⅞—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met of Melbourne 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Met of Melbourne 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 27	3½	Monte Video. Ltd. . .	12½—13	..	5 7 8
1,775,892	Stk.	July 29	4½	Newc'tle & G't'sh'd Con	106½—107½	..	4 3 9
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	92—93	..	3 12 2
55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13—13½*	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	139—141	..	5 13 6
60,000	5	Mar. 31	8	Ottoman, Ltd. . . .	6⅛—6⅜	..	6 5 6
31,800	50	Aug. 26	13	Portsea Island A. . .	137—139*	..	4 19 0
60,000	50	,,	13	Do. B. . .	129—131*	..	4 19 3
100,000	50	,,	12	Do. C. . .	120—123*	..	4 17 7
114,800	50	,,	10	Do. D and E.	101—103*	..	4 17 1
398,490	5	May 13	7	Primitiva Ord. . . .	6⅞—7⅛	..	4 18 4
796,980	5	July 29	5	Do. 5 p.c Pref. .	5¼—5½	..	4 10 10
488,900	100	June 1	4	Do. 4 p.c Deb. .	94—96	..	4 3 4
1,000,000	10	Apl. 29	8	River Plate Ord. . .	16¾—17¼	..	4 12 9
312,650	Stk.	June 25	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	14¼—14¾	..	5 8 6
62,500	10	,,	6	Do. 6 p.c. Pref. .	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49½—50½	..	4 19 0
135,000	Stk.	Mar. 12	10	Sheffield A	231—233	..	4 5 10
209,984	,,	,,	10	Do. B	231—233	..	4 5 10
523,500	,,	,,	10	Do. C	231—233	..	4 5 10
70,000	10	June 11	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Aug. 12	5⅓	South Met., 4 p.c. Ord.	119—121	..	4 8 1
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	85—86	+½	3 9 9
209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	153—155*	+3	5 3 3
605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	118—120	..	4 11 8
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord. . .	110—112	..	4 9 3
120,000	Stk.	Aug. 12	6⅞	Tottenham and Edmonton A 5 p.c. .	132—134	+2	5 2 7
453,940	,,	,,	5⅜	Tottenham and Edmonton B 3½ p.c. .	110—112	+1	4 15 11
149,470	,,	June 25	4	Tottenham and Edmonton 4 p.c. Deb.	100—102	..	3 18 5
162,300	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109—111	..	4 10 1
255,6?6	Stk.	Aug. 26	6⅝	Wandsworth B 3½ p.c. . .	138—140*	..	4 14 8
79,416	,,	June 25	3	Wandsworth 3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	,,	Aug. 12	5⅜	West Ham 5 p.c. Ord. .	124—126	..	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref. . .	127—129	..	3 17 6
253,300	,,	June 25	4	Do. 4 p.c. Deb Stk..	112—114	..	3 10 2

Prices marked * are "Ex div." † Next dividend will be at this rate.

absorbed £450, and the balance of £225 was placed to the reserve fund. The Directors submitted a statement regarding the present position of the negotiations with the Town Council. Mr. A. Silverthorne, of London, inspected the works on Dec. 16 last, and reported to the Town Council that the value of the undertaking was £15,980. There were some very serious and vital misstatements in this report, to which the attention of the Directors had been drawn by their Manager. On March 2 last, the Town Council offered £16,000 for the undertaking, exclusive of cash in hand and stocks. Alternatively they offered to take over the whole assets and liabilities of the Company at a capitalized sum to be arrived at on the basis of £2 15s. per share on 4000 shares. These offers were so ridiculously inadequate that the Directors refused them. On March 5, the Town Council asked the Directors to give an indication of the sum at which the shareholders would be prepared to sell. They therefore instructed Mr. A. Yuill, of Dundee, to value the undertaking and report. Mr. Yuill reported that he valued the undertaking at £22,396, exclusive of cash in hand and in bank, stocks, and book debts, amounting to £1274—a net total of £23,670. He considered this value a very fair one. On July 7 the Directors intimated to the Town Council that they were prepared to recommend the shareholders to sell their undertaking at this price. On July 12, the Directors had a conference with Provost Walker, Bailie Rae, and ex-Provost Soutar (as representing the Council); and Messrs. J. Nicoll, R. C. Mathewson, and W. M'Naughton (as representing the ratepayers). At this conference, Mr. Nicoll intimated that he thought the ratepayers would be willing to approve of £20,000 as the price, and ex-Provost Soutar stated that the Town Council were prepared to offer £19,000. On July 15, the Directors informed the Council that they would recommend the shareholders to sell for £21,000. Since then there had been no further communication received from the Town Council.

It is an agreeable sign of civic intelligence to find that an interest was taken by the community of Carnoustie in the gas transfer. There were a few doubting ones who gave voice to their opinions by means of newspaper correspondence. But over and above this movement, a more forcible development has arisen in the step taken by Bailie Rae in addressing outdoor meetings of the ratepayers. On Wednesday he addressed two meetings. The burden of his remarks was that it did not matter to the gas consumers of Carnoustie whether one or a score of irresponsibles were egotistical enough to imagine that they were gas experts. What they really had to concern themselves about was not altogether what the works were worth, but whether the undertaking could be purchased at such a price as would enable the Town Council to give the consumers better terms. He was perfectly satisfied that this could be done. He produced the balance-sheets of the Company for the past two years, and these, he stated, showed that the Town Council would have almost £2000 to work upon. The meetings were decidedly favourable to the transfer. Then last night there was a public meeting in support of the transfer, at which a resolution in favour of the step was unanimously adopted.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Sept.* 4.

The month has opened with good demand, and production has been readily absorbed, but, though prices continue to harden, there has been no decided advance. The closing quotations are: £11 5s. per ton f.o.b. Hull, £11 6s. 3d. per ton f.o.b. Liverpool, and £11 8s. 9d. to £11 10s. per ton f.o.b. Leith. For delivery up to the end of the year, £11 8s. 9d. to £11 10s. per ton, according to port, has been paid, and £11 12s. 6d. per ton f.o.b. Leith for the spring months. At the close, £11 15s. per ton f.o.b. Leith, for 1910 delivery, is being quoted, but so far this price has not been reported paid.

Nitrate of Soda.

This article continues quiet without any alteration in values; the spot quotations still being 9s. 6d. and 9s. 9d. per cwt. for ordinary and refined qualities respectively.

Tar Products. LONDON, *Sept.* 6.

The markets have continued steady during the week. Pitch is very firm all round, and the majority of makers are holding their hands at present in the hope of securing better prices. Orders from the Continent are scarce; but in South Wales the demand is again good for prompt delivery. Creosote is quiet, and orders decidedly scarce; but makers are hopeful that American orders will come along freely at an early date. Meantime, shipments are good, and the majority of stocks small. Benzols are quiet; but toluol is in good demand in the North. Solvent is steady all round, and decidedly firm in London for London makes. Carbolic is very dull, and 60's are said to have been sold at 10¾d. Rotterdam, equal to 10¼d. east coast. Naphthalene is dull, and salts are steady. Tar is fetching good figures.

The average values during the week were: Tar, 15s. 3d. to 19s. 3d. Pitch, London, 30s.; east coast, 29s. 9d. to 30s.; west coast, 28s. 6d. to 29s. 6d. f.a.s. Mersey ports, 28s. to 28s. 6d. f.o.b. other ports. Benzol, 90 per cent., casks included, London, 6¼d. to 6½d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7d. to 7½d.; North, 6½d. to 7d. Toluol, casks included, London, 8¾d. to 9d.; North, 8½d. to 8¾d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3⅛d.; solvent naphtha, casks included, London, 11d. to 11¼d.; North, 10d. to 10¼d.; heavy naphtha, casks included, London, 10½d. to 10¾d.; North, 9½d. to 9¾d. Creosote, in bulk, London, 2¾d.; North, 2⅛d. to 2½d. Heavy oils, in bulk, 2⅞d. to $2\frac{15}{16}$d. Carbolic acid, 60 per cent., casks included, east coast, 10½d. to 10¾d.; west coast, 10¼d. to 10½d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has been steady throughout the week, and the slight improvement shown at the close of last week has been maintained.

The Gas Companies are still quoting £11 7s. 6d., and are hopeful of obtaining this figure ere long. London makes are reported to have been sold on Beckton terms at £11 2s. 6d. Hull stuff has been sold at £11 3s. 9d. and £11 5s., and to the end of June next at £11 7s. 6d. At Liverpool and Leith, about £11 5s. and £11 7s. 6d. are the values respectively.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a little more activity and steadier prices in the coal trade of the North. In steam coals, best Northumbrians are from 11s. 3d. per ton f.o.b., with a rather fuller demand. Second-class steams are from 10s., and steam smalls are from 5s. to 6s. Work at the collieries is now less interrupted, and there is a more regular shipment—mostly on contracts, however. In the gas coal trade, the demand is steadily improving, both for home use and for export; and the only difficulty has been a slight lack of ready steamers at some of the shipping ports. Durham gas coals vary from 10s. to 11s. 3d. per ton f.o.b. for the usual classes; and for "Wear" specials up to about 11s. 7½d. is quoted. More sales are negotiating for export, though slightly lower prices are now offered than a month ago—about 10s. per ton being the f.o.b. price named for second-class Durham coals; but sellers are not so ready to accept this price, though the tendency is to ease in values at the present time. Coke is firmer; and good gas coke is from 12s. 6d. to 13s. per ton f.o.b. in the Tyne—the output being now heavier.

Scotch Coal Trade.

The coal market is quiet, the demand not being equal to the output. Notwithstanding, though buyers are desirous of purchasing forward, coalowners are not disposed to accommodate, unless at substantially advanced prices. The quotations now are: Ell 9s. to 10s. 6d., splint 10s. 3d. to 10s. 6d., and steam 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 364,196 tons—an increase of 21,799 tons upon the previous week, and of 52,531 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,827,139 tons—an increase of 593,119 tons upon the corresponding period.

"Aladdin" Incandescent Oil-Gas Lamp.—Demonstrations were given with these lamps last week in the open air, in South Market Street, Aberdeen. The lamps are made in two sizes—1000 and 300 candle power. The demonstrations given were with the larger lamp. It is claimed that any brand of petroleum can be used with the lamp; and also that it can be used in the open air in any kind of weather. The larger light, it is said, can be run at a cost of ½d. and the smaller one at ¼d. per hour. The demonstrations gave satisfaction to spectators who are interested in the lighting of large work places, such as fish-curing yards, of which there are many in Aberdeen.

Salford's Supply of Gas Coal.

A resolution passed by the Salford Corporation Gas Committee, rescinding the acceptance of a tender for the supply of coal to the department, and substituting that of another firm, gave rise to a good deal of discussion at a meeting of the Council last Wednesday. It was stated, in support of the resolution, that the sample load did not meet the requirements, and accordingly coal of a better quality was recommended. Those who opposed the resolution argued that the firm whose tender it was now sought to reject would supply the better quality at a figure which was 3d. per ton lower than that of the firm to whom it was proposed to give the order. Alderman Phillips, the Chairman of the Gas Committee, explained that the offer to supply at 3d. per ton less was only made some weeks after the tenders sent in had been opened and published. Consequently, it would be manifestly unfair to accept an amended tender made in so irregular a fashion. Mr. Bescoby moved an amendment that the resolution should be referred back; but it only found four supporters.

Ottoman Gas Company, Limited.—In the report to be presented at the meeting of the Company to-day, the Directors state that the gas-rental for the six months ended the 30th of June amounted to £17,082, whereas for the corresponding half of last year it was £15,232. The net profit is £4204, against £3755 for the six months ended June 30, 1908. The amount standing at the credit of the profit and loss account is £12,290; and the Directors recommend the payment of a dividend at the rate of 7 per cent. per annum on the preference shares, less income-tax, and at the rate of 8 per cent. per annum on the ordinary shares, tax free—leaving a balance of £9393 to be carried forward.

Local Government Board and Applications for Loans.—In the course of an inquiry held at Torquay last week, on behalf of the Local Government Board, respecting the application of the Town Council to raise certain loans, Mr. F. H. Tulloch, one of the Board's Inspectors, made some remarks on the practice of local authorities in executing works and then applying for authority to borrow the money to pay for them. One of the sums which the Corporation asked for was £2865 for the extension of water-mains and other works arising out of the increasing demand for water. The Water Engineer (Mr. S. C. Chapman) explained that the works were rendered necessary by the general growth of the district, and that in consequence of the demand for water some of the work had been already executed—the cost being defrayed by an overdraft at the bank. The Inspector said the Local Government Board did not like things being done in this way. Application should be made for a sufficient sum to last not more than three years; and then, on a loan being granted, a record should be kept of the streets in which mains were laid, and particulars of the cost, so that when the money was exhausted a loan could be obtained for another three years. These things could usually be foreseen; and the view of the Board was that permission should be obtained first, and the work done afterwards.

Large Water-Main Contract for Calcutta.

It is always pleasant to hear of the success of English firms—especially during times such as those we have recently been passing through. We are therefore glad to learn that the well-known and old-established firm of Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, have been awarded a contract of considerable magnitude in a world-wide competition for the supply, delivery, and erection in Calcutta of 6 feet and 5 feet riveted steel mains for the water supply of the city. The Corporation Engineer (Mr. W. B. MacCabe, M.Inst.C.E.), after carefully considering the numerous tenders offered, recommended the design of Messrs. Ashmore, Benson, Pease, and Co. as represented by the drawings submitted with their offer. The main lines of pipes will be 6 feet and 5 feet internal diameter, with reducing-pieces and valves at the various branches, which occur at frequent intervals, to connect up to the smaller distributing mains. The total length of the main lines will be about 4¼ miles. They will pass through the principal thoroughfares of the city, and where necessary will be carried by riveted lattice girder bridges with water-trough bottoms over canals and railways. The bridges, which also form part of the contract, will have suitable arrangements providing for expansion and contraction. The total weight will be considerably over 3000 tons. The whole of the materials in the contract will be of British manufacture. The work has to be completed within two years from receipt of instructions to commence; and as three months of each year is a rainy season during which it is not practicable to continue the work of erection, this means that the whole contract must be carried out in eighteen months.

Successful Rating Appeal at Malton.—We learn from Mr. Henry Tobey, the Secretary and Manager of the Malton Gas Company, that, as the result of an appeal, the Assessment Committee of the Malton Union have agreed to reduce the rateable value of the Company's property from £708 to £550. The appeal was based upon the decreased profits the Company are making owing to the low price of gas, the competition of electricity, the loss of public lighting, the enhanced price of coals, and the extra labour and expense attending penny-in-the-slot installations.

Suicide by Gas at Liverpool.—An inquest has been held on the body of Joseph Watson, who was formerly a farmer in Australia, but came to Liverpool about two years ago, and had since carried on a general shop. For some time deceased had been depressed and worried. Last Tuesday, his wife left him in charge of the shop, while she went to look after some business; and on her return some hours later, she found a note in his handwriting, and called a neighbour, who sent for a policeman. The latter went upstairs and discovered deceased lying on the bed with an india-rubber tube, which had been fastened to the gas-bracket in his mouth. The room was full of gas. The doctor who was called pronounced life extinct, death being due to gas poisoning. The jury returned a verdict of "Suicide while temporarily insane."

The Dangerous Chandelier Again.—Serious personal injury and a great deal of damage to property were caused at West Hartlepool on the 28th ult. by a severe gas explosion at the residence of Mr. R. J. Marshall, a builder and contractor, who resides on the road leading to Hartlepool. Mrs. Marshall had detected a smell of gas in the dining-room, and informed her husband, who, with his son, went into the room. The former poured some water into the chandelier, from which the escape occurred, and apparently a match was afterwards struck, for there was an explosion, which shattered almost every window in the house, as well as seven in a house on the opposite side of the street. The contents of the room were thrown about in the most extraordinary manner, and some valuable oil paintings were ruined. Mr. Marshall was for a moment enveloped in flame, and was dashed against a wall by the force of the explosion. He was found to have been badly burned about the arms and eyes, and his hair was burnt off. His son escaped with slight shock.

High-Pressure Gas-Lighting at Wolverhampton Skating Rink.—The Wolverhampton Gas Company have recently had in hand the lighting of the skating rink, the area of which is about 170 ft. by 120 ft. The high-pressure system has been adopted, with Graetzin lamps, inverted burners, and the provision of independent flues to effect the dispersion of the products of combustion. The results are increased illumination, which is absolutely shadowless. There are five burners in each lamp, giving a light of 600 candles per lamp, with a consumption of 25 cubic feet of gas per lamp. There are in all 30 lamps in use, giving a lighting power of about 18,000 candles, at a cost of 2s. per hour for the whole of the lighting of the rink. This is controlled in sections by bye-pass taps, so that the attendants can have the lighting under their control without entering the skating area. The installation, which is on a novel and effective system, has been carried out under the supervision of Mr. P. G. Winstanley, the Gas Company's Engineer and Manager.

Penny-in-the-Slot System a Remedy for Defaulting Gas Consumers.—At the Halifax Borough Police Court, a few days ago, about 80 defaulting gas consumers were summoned. The defendants generally pleaded inability to pay on account of sickness or unemployment; and in some cases orders for payment in fourteen days were made—more time being allowed in a few cases where prolonged unemployment had been experienced. The Chairman (Mr. J. H. Howarth) said the Bench wished him to ask Mr. Farrar (representing the Corporation) why a number of these defaulters could not be put on the penny-in-the-slot system. Mr. Farrar replied that they could; but that it rested with them to make application. The Chairman: Why should not the Corporation take the matter in hand and put slot-meters in? You might make a regulation that if the consumers would not have these meters you would not supply them with gas. He added that the Bench were of opinion that if this were done it might be a remedy in a great many cases; and it would be better for the customers as well as for the Corporation. Mr. Farrar said he would see that the suggestion was sent to the Committee.

Two Light Failures at Clapham (Yorks.).—A correspondent who was recently spending the week-end at the above-named place informs us that on the evening of Sunday, the 29th ult., the electric light at the church failed immediately after the sermon; and upon the visitors (including the clergyman) returning to the hotel, the acetylene gas followed the lead of the other illuminant, and went out. This was a rather curious coincidence.

Gas Question at Heckmondwike.—A meeting of the Heckmondwike Urban District Council was held last Thursday, for the purpose of discussing the advisability or otherwise of joining with the Liversedge Council in promoting a Parliamentary Bill authorizing the formation of a Joint Board to acquire the Heckmondwike and Liversedge Gas Works. After discussion in committee, it was moved by the Chairman (Mr. S. Wood), seconded by Mr. Clarke, and unanimously approved, that the members vote for the statutory resolution referring the matter to the consideration of the ratepayers.

Water-Works for Elloughton and Brough.—On Saturday, the 28th ult., the water-works which have been erected for the supply of Elloughton and Brough were formally opened by Mrs. Harrison-Broadley. The water is obtained from certain springs issuing from the chalk in two plantations belonging to Colonel Harrison-Broadley, M.P., on either side of Elloughton Dale, about half-a-mile from Elloughton. The water, which is described by analysts as admirably suited for drinking and domestic purposes, flows by gravitation into a reservoir having a capacity of 60,000 gallons, or equal to two days' maximum supply. Colonel Harrison-Broadley, who presided at the opening ceremony, expressed the hope that the water would give every satisfaction to the users. As the water-works were owned by a private company, there would be no increase in the rates. He recommended the scheme to the notice of the East Riding County Council.

The Proposed Acquisition of the Pontypridd Water Company by Local Authorities.—After a formal report had been submitted to the Pontypridd Council, at a recent meeting, as to the rejection of the Glamorgan Water Board Bill by the House of Lords, the members discussed in private the possible acquisition of the undertaking of the Pontypridd Water Company conjointly with the Rhondda Council. The Clerk (Mr. Colenso Jones) intimated that the Water Company were prepared to dispose of their undertaking to the two Councils on the terms agreed upon for its purchase by the County Council had the Bill gone through. These were £310,000 for the existing undertaking, £15,000 in respect of the parliamentary powers obtained for the construction of the Llia (Breconshire) scheme, together with subsequent parliamentary expenses in the promotion of Bills, and an amount to be fixed upon by the Local Government Board as compensation to the Directors and officials of the Company. A Committee of seven members was appointed to meet representatives of the Rhondda Council, to confer as to the acquisition of the undertaking, and, provided an agreement can be arrived at, to seek parliamentary powers for its purchase.

Suicide of an Actress by Gas.—A verdict of "Suicide while of unsound mind" was returned by the Coroner's Jury who inquired into the death of Mary Wilde (aged 67), of Kilburn, who at one time was an actress. Deceased was found dead in bed, with the apertures of the door and windows of her room stuffed up with paper, and the tap of a gas cooking-stove turned full on.

The Fatal Gas Explosion at Southport.—The adjourned inquest was held at Southport, on Monday last week, by Mr. S. Brighouse, concerning the death of Alice Ann Nuttall, aged ten years, of Dyson Street, Blackburn, who died as the result of a gas explosion at the house of her uncle, Isaac Nuttall, grocer, 20, Southbank Road, Southport, where she was visiting, on the 12th ult. (see *ante*, p. 470). Mr. Nuttall, who was badly injured in the explosion, said he went into a bedroom, and there detected a smell of gas. He tried the taps, and found they were off. His wife went into the sitting-room, and told him she could smell gas. He went there, tried the taps, and then pulled down the chandelier in order to put water into it. Finding no escape, he brought a lighted taper and turned on the taps. He had ascended about three steps when the explosion took place. The Jury returned a verdict of "Accidental death."

The Lighting of Paignton.—An example of the "pushing" methods of electric light companies was afforded at the last meeting of the Paignton District Council, when a letter was read from the local Electric Light Company offering to alter and adapt twelve of the existing gas-lanterns for 50-candle power Osram lamps. The Company would maintain the lamps and supply lighting for 1500 hours per annum at a cost of £2 10s. per lamp, provided they were given a contract for three years. The Lighting Committee recommended that, as an experiment, three lamps should be adapted to electric light as proposed. Mr. Foxworthy said the Gas Company would be prepared to supply 100-candle power burners and lanterns for the same cost. If the lighting had not been satisfactory, complaint should have been made to the Gas Manager, who would have remedied it. When they adopted electric lighting for the sea-front, they were told that it would do away with 27 gas-lamps; but so far only 14 lamps had been removed, and he did not see where the saving came in. Mr. Moore, a Director of the Gas Company, was in favour of the Council adopting the best light at the cheapest cost. When the present gas-lamps were put up, they were equal to a light of 100-candle power each. If they had since given less satisfactory results, the Gas Company were prepared to clean the burners and lanterns and replace the mantles, so as to make them equal to what they were at first. Mr. Sarson, a Director of the Electric Company, disclaimed any desire on their part to oust the Gas Company; but they offered, as an experiment, to put up a 100-candle power light in any position the Council chose, and maintain it for a fortnight. The Chairman (Mr. Parnell) said the Gas Company charged £3 per annum, the Electric Light Company offered to do the lighting for £2 10s.; and the suggestion of the Committee was that they should try only three lamps as an experiment. The recommendation of the Committee was approved.

National Lighting Corporation, Limited.—This is the title of a Company registered on the 30th ult., with a capital of £1000 in £1 shares.

Fatality at the Lausanne Gas-Works.—It is rather curious that, following our account last week of the deplorable accident at the Geneva Gas-Works, we should have to record a fatality at the works supplying the neighbouring town of Lausanne. It occurred the day after the Geneva explosion. A workman was cleaning the top of the superheater of the water-gas plant, and had left his mate only ten minutes when he was found dead. Artificial respiration was tried; but, unhappily, it was unsuccessful. The plant was not in operation, but was heated up for working next day. Suffocation must have resulted from the inhalation of the carbon monoxide gas from the generator.

Sales of Shares.—At the Public Hall, Wisbech, a few days ago, Mr. Joseph Johnson offered for sale some ordinary £10 shares (6 per cent.) and some original shares (9 per cent.) of the same nominal value in the Wisbech Water Company. The price realized for the former was £14 10s. each, and for the latter £19 15s. apiece. An important sale of £3000 of new ordinary consolidated 5 per cent. stock of the Basingstoke Gas Company was recently conducted by Mr. A. W. Tyrrell. It was offered in lots of £100, £50, £20, and £10; and the premiums realized on each class were 8 to 11½, 6 to 8, 5 to 7¼, and 5 per cent. respectively—the average price obtained being £108½ per £100 of stock.

Dartmouth Water-Works Extension.—An inquiry was held at Dartmouth last Wednesday, by Mr. F. H. Tulloch, on behalf of the Local Government Board, respecting an application by the Town Council for power to borrow £1000 for the water-works. It was explained that the Council borrowed £6000 for the improvement of the water supply recently carried out; but additional expense had been incurred which it was necessary to meet. The Town Clerk (Mr. S. J. Pope) and the Borough Surveyor (Mr. T. Joyce) explained how the extra expenditure was incurred; the chief portion being in connection with the construction of a reservoir, the ground presenting some difficulties, and rendering it necessary to use more concrete than was originally intended.

Coal Tar for Roofs.—In answer to the inquiry by a correspondent of the "Ironmonger" on the above subject, to which reference was made in the "JOURNAL" last week (p. 594), Messrs. Brownlie and Murray, Limited, of Fenchurch Street, E.C., have written to our contemporary that after a long experience in the painting of galvanized and corrugated sheets for roofing, they have arrived at the conclusion that the reason why the matter indicated is of no use for the purpose is that it blisters under the heat of the sun. Afterwards the blisters break, and rain and moisture get into the recess and eat away the sheets. Messrs. Samuel Courtney, Limited, of Dalton Street, Belfast, have written as follows: "Coal tar is not a suitable coating for galvanized iron roofs, as it contains organic acids which rapidly attack the metal. The best coating is a good quality of bitumen solution made from natural bitumen freed from all acids."

Rochdale Corporation Water Undertaking.—At a meeting of the Rochdale Town Council last Thursday, Mr. Sharp asked if it was a fact that the water undertaking of the Corporation had cost £720,960, and was not paying. The Chairman of the Water Committee (Alderman W. T. Heap), in reply, said the cost of the works exceeded the amount named. The undertaking was not paying; and between £2000 and £3000 more than last year would be required for the renewal of pipes.

Messrs. Willey and Co., Limited, have sent us their new catalogue of gas-fittings, &c., which contains a very fine collection of brackets for both upright and inverted burners, pendants, church fittings, mantles, meters, &c. The goods shown occupy about 150 large quarto pages; and they are very artistically and effectively presented. The catalogue is bound in cloth, gilt lettered.

Last Wednesday, one of the city water-mains burst at the top of Hill Street, Birmingham. Traffic along the thoroughfare was stopped; and in response to a message, the Water Department dispatched a staff of men to the spot. The water was turned off, and remedial measures taken, though not without some difficulty, owing to the fact that the junction of the mains occurs at this point.

By 53 votes to 18, the Manchester City Council last Wednesday adopted a resolution for the appointment of a Special Committee to report on the desirability of fixing the hours of labour for all Corporation employees at eight hours per day, or 48 hours per week. Mr. Johnston, who moved the resolution, said that the eight-hour system was working smoothly in the Gas and Electricity Departments, though the hours worked there might exceed 48 per week.

We have received the season's supplementary list (1909) of the Pneumatic Gas Lighting Company, Limited, which contains several new fittings and accessories. Among other things may be mentioned a pear-shaped hanging push, suspended on a flexible tube or cord, a curved bye-pass fitted with a draught protection shield, a third sized tubing in 96-inch lengths for very long distance lighting, and connection rings to slip over down-stems, &c. The list includes a useful set of instructions for fixing the apparatus.

We have received from Mr. W. Briggs, of 5, Lambeth Hill, Queen Victoria Street, E.C.—who read a paper before the London and Southern District Junior Gas Association last autumn, on "Heating Water by Gas"—a useful collection of working notes for gas inspectors, foremen, and fitters, presented in a neat booklet bearing the title of "Tatsal Tips." The notes have been compiled by Mr. F. C. Briggs in great measure from actual working tests. They embody an experience extending over 35 years; and their purpose is to answer many of the questions which daily confront the engineer and fitter. As one of these frequently bears upon the relative cost of gas and electricity, the page devoted to this subject will be found very convenient for reference; as will those containing hints on hot-water circulation and the generation of steam. Mr. Briggs will be pleased to supply copies of his little book on application being made to him.

The Davis Gas Stove Company, Limited, have declared an interim dividend on the ordinary shares at the rate of 5 per cent. per annum for the six months ending the 30th of June.

Messrs. Silcock and Tongue, of Aston, Birmingham, make a speciality of outside lamps for street, hotel, and window lighting, and also for advertising purposes; and they have just issued a new priced catalogue (No. 16) in a more compact form than hitherto. Gas and oil lamps are shown in the greatest possible variety; and there is a good collection of brackets, standards, and arches. All the lamps are made on the firm's premises, under their personal supervision.

The Carron Company have just executed an important order for fire-grates for the Ameer of Afghanistan's new palace in course of erection at Cabul. These fire-grates, 22 in number, are fitted with dogs to harmonize, and have heavy canopies of different kinds. The designs, which have been approved by the Ameer, are essentially Oriental in style, presenting a striking and handsome appearance; while on the brass-work, of which the grates are almost wholly composed, much hand labour has been expended. A special feature of these grates is the unusually large fire space, on the assumption that wood will be burned as fuel. The grates are beautiful examples of the ironfounder's art.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure Insertion in the following day's Issue.

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Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager.

Sealed and endorsed Tenders to be sent to me not later than Tuesday, Sept. 14, 1909.

By order,
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Town Clerk.
Municipal Buildings, Heywood,
Aug. 18, 1909.

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Copies of the Specification and Drawings can be obtained on and after Wednesday, the 1st day of September next, on Payment of One Guinea.

Tenders, addressed to the undersigned, to be delivered on or before Wednesday, the 22nd day of September next.

The Directors do not bind themselves to accept the lowest or any Tender.

R. O. PATERSON,
Engineer and Manager.
Gas-Works, Cheltenham,
Aug. 25, 1909.

COKE.

THE Directors of the Wandsworth and Putney Gaslight and Coke Company invite TENDERS for the Removal of about 10,000 Tons of Guaranteed "WANDSWORTH" COKE from their Works at Wandsworth between Oct. 1 next and March 31, 1910.

The Coke to be removed by Van or by Barge (free waterway on River Thames).

Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than the 17th of September.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Any further Information may be obtained from the Engineer, Mr. H. O. Carr.

CHAS. W. BRAINE,
Secretary.
Wandsworth and Putney Gaslight and Coke Company,
Fairfield Street, Wandsworth, S.W.
Aug. 25, 1909.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

THE Committee invite Tenders for the Purchase of the whole of their Surplus COKE (estimated at from 1500 to 2500 Tons), or for Quantities of not less than 200 Tons per Annum, from the 1st of October, 1909, to the 30th of September, 1910, delivered free on Rail or Barge, Ramsgate, or free into Carts at the Gas-Works, Ramsgate. Purchaser in any case to pay dues.

Further Particulars, together with Conditions and Form of Tender, may be obtained from the undersigned.

Tenders to be sent in not later than Noon on Monday, Sept. 13, 1909, addressed to the Chairman of the Gas and Water Committee, Boundary Road, Ramsgate, endorsed "Tender for Coke."

The Committee do not bind themselves to accept the highest or any Tender.

WM. THOMSON,
Engineer and Manager.
Gas and Water Offices,
Boundary Road, Ramsgate,
August, 1909.

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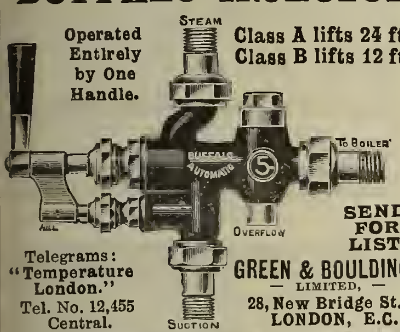

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[See Illustrated Advertisement, Aug. 10, p. 420.]

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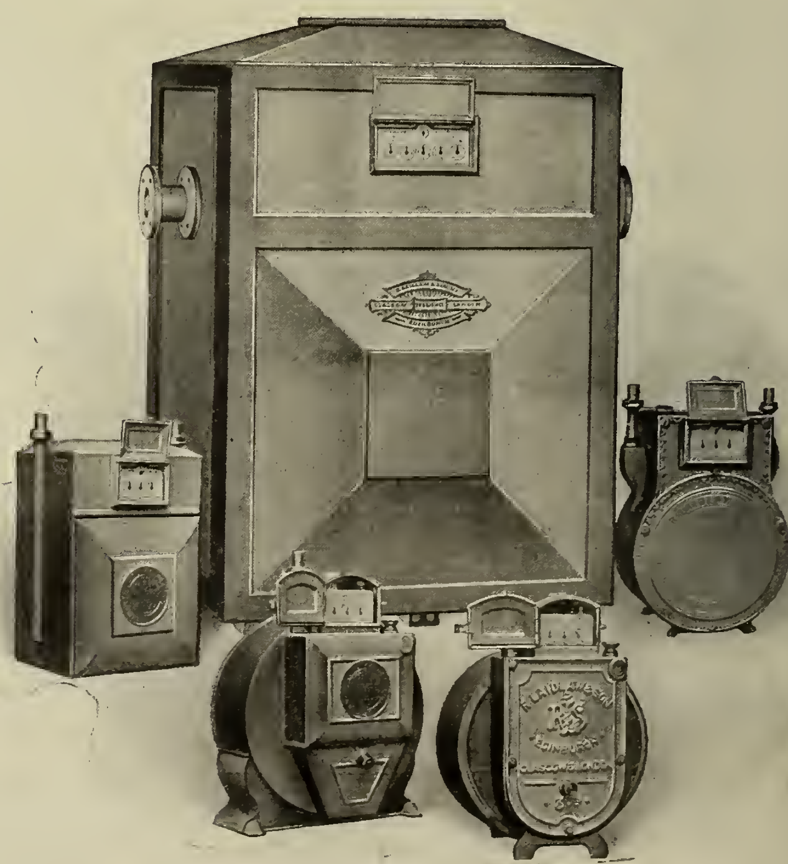

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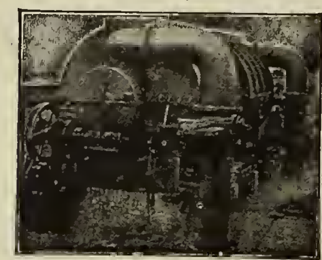
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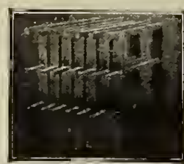
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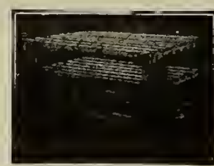
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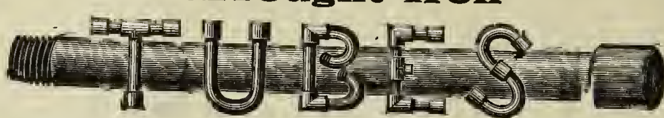

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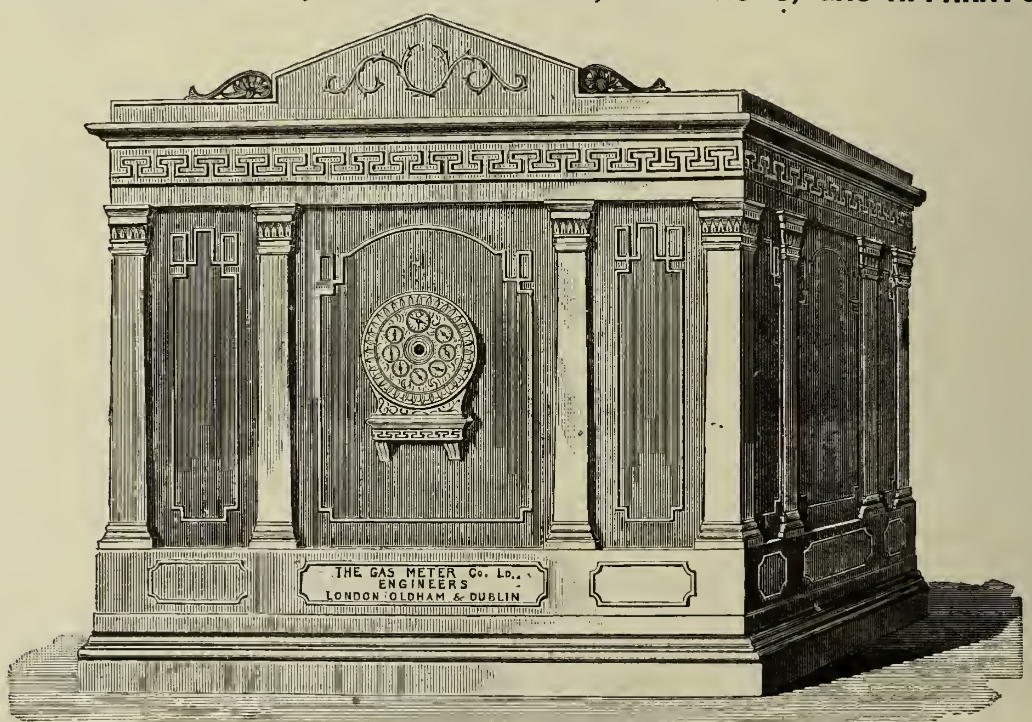

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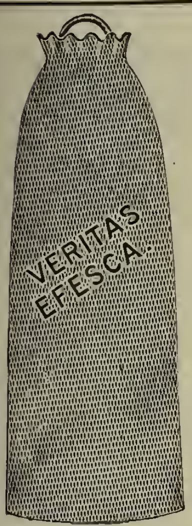

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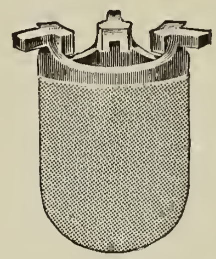

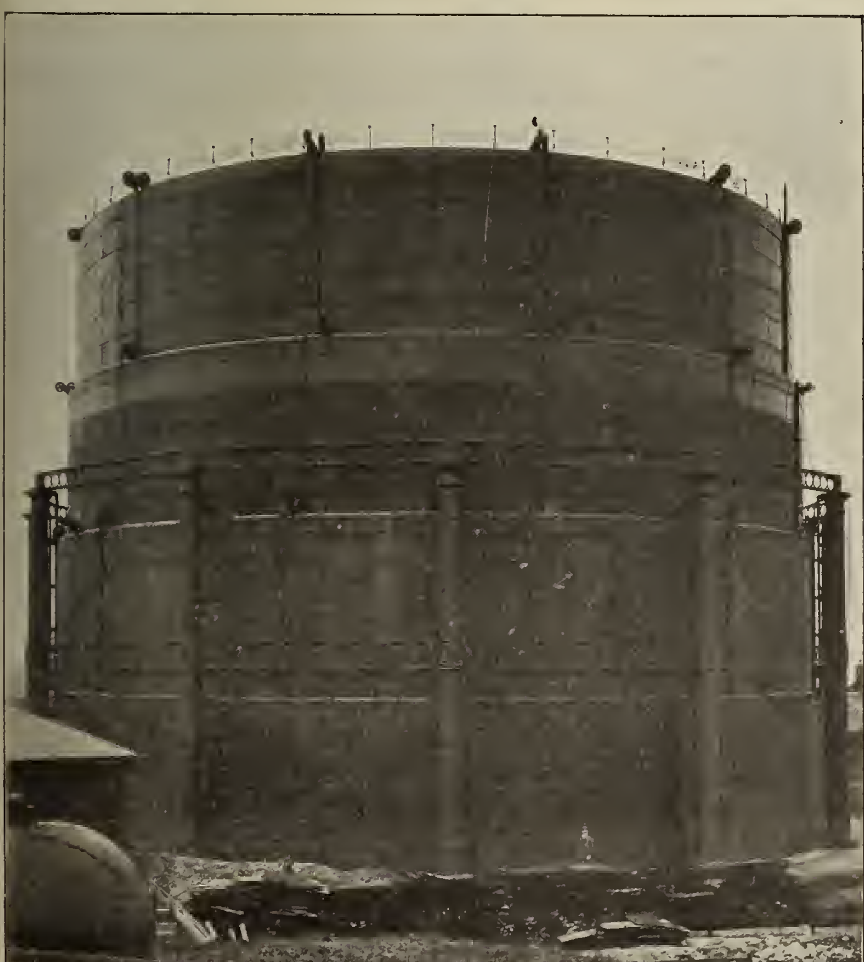

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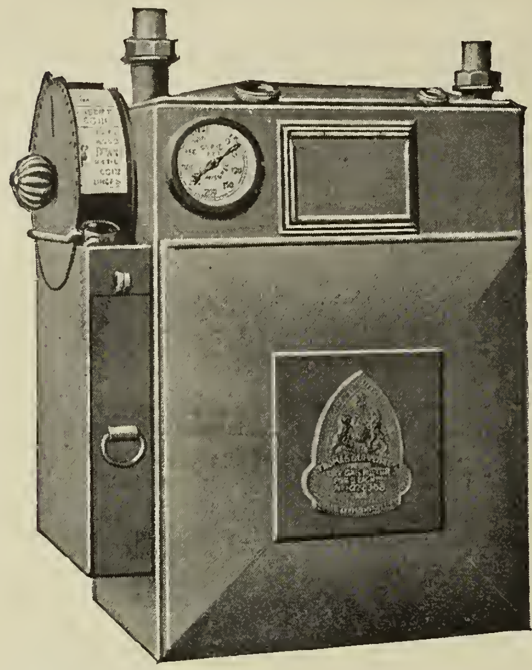

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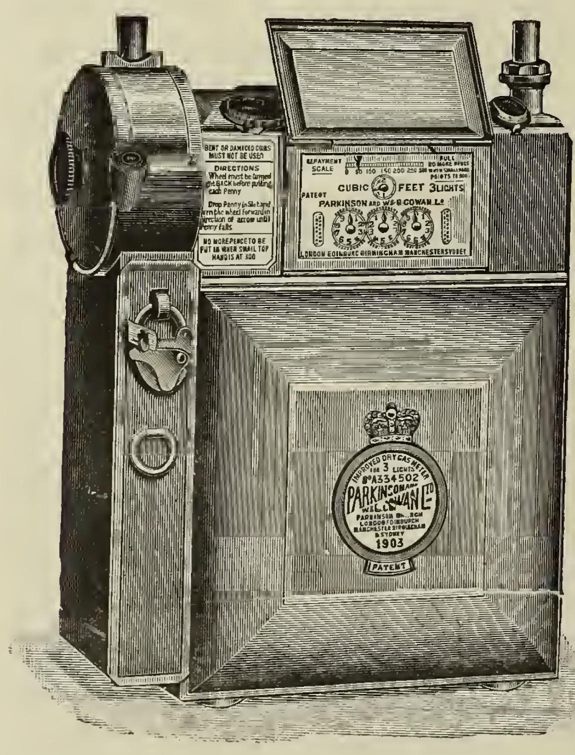

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

Editor & Publisher: WALTER KING. Office: 11, Bolt Court, Fleet St., London.

VOL. CVII., No. 2418.——TUESDAY, SEPTEMBER 14, 1909.

EDITORIAL NOTES—GAS, &c.

Continuous Carbonization on the Large Scale.

In another part of the "Journal," an outline description is given of the first installation on the large scale of the Woodall-Duckham continuous system of carbonization in vertical retorts. This plant is at the Kensal Green station of the Gaslight and Coke Company; but it is only in advance by two or three weeks of the installation (smaller by merely one bed of four retorts) at the Burnley Corporation Gas-Works. The ten settings of four retorts, the rearing of which is now almost completed, with the ancillary plant, at Kensal Green, will have a nominal carbonizing capacity of 100 tons of coal a day; but the productive capacity may be taken at not less than $1\frac{1}{4}$ million cubic feet, which is twice as much as was produced formerly on the same ground area with horizontal retort working. Technically, this is a very interesting point to gas engineers suffering from confined works, and with no land adjacent available for annexation. With vertical retorts—coal feeding being on the top of the bench, and coke removal going on directly under the bench—the margin of ground space around need not be more than is essential for facile inspection, and repairing and reconstruction work. This enables the capital outlay on structures for the housing of the carbonizing plant to be brought down to the minimum in relation to output.

Where coke-conveyors are adopted in connection with the continuous system, the modest requirement in respect of labour is another feature; as a matter of fact, one cannot be quite sure yet as to the point, until there has been further experience, at which it can be said that the utmost possible in labour economy has been realized. In this first section of plant, there are only 40 retorts fed and discharged mechanically; and they will carbonize a minimum quantity of 100 tons of coal a day, with only three men on duty per shift. When the second section is erected, if the working of the present installation fulfils all expectations, it is quite possible the total number of men required on the complete installation will be proportionately less in relation to the quantity of coal carbonized.

A survey of the Kensal Green settings shows us that the extended experience with the latest alterations in the coke-extracting devices and other improved details has revealed nothing requiring modification in designing the larger plant, excepting in a minor point or two. At these works, the installation will have every possible chance. The auxiliary plant throughout—from condensers and exhausters to gasholders—will, with the new settings, constitute a complete gas-works. And as the working of the plant will be under the supervision of the Chief Engineer of the Gaslight and Coke Company (Mr. T. Goulden) and the direct control of the Station Engineer (Mr. A. S. Baker), there is assurance that there will be nothing fictitious or assumed about the records that, it may be confidently expected, will hereafter be published. The system has here a fine opportunity of proving itself; and there can be no doubt that, when the plant has settled down to work, Kensal Green will be a Mecca for gas engineers who are stationed in the south and in the Midlands, as, similarly, Burnley will be for engineers northward.

We hope that Messrs. Woodall and Duckham will now reap the reward of their years of ardent industry in perfecting a system of continuous carbonization involving so many intricate problems. They have trodden paths in coal carbonization for the production of gas that have never been trodden before; and though there has been much to dishearten, there has been an exhaustless and unsuppressible perseverance in gaining the desired goal. Their honour, no one can gainsay, is great; we wish for them something more tangible in the commercial competition upon which they have now entered with a full belief in the virtues of what they have to offer.

Capital and Labour.

Socialism in all its nakedness has been the dominant feature at the Trades Union Congress at Ipswich during the past week. It is a matter for profound regret that the old protective objects of the trades unions, to which there could be no genuine objection when prosecuted and guarded with a just consideration for the rights of all men, are fast receding to a secondary place, and that the foremost position is now being occupied by ultra-socialism. The President of the Congress (Mr. D. J. Shackleton, J.P., M.P.) is one of the best disposed and most cultured of the labour party in the House of Commons; and, unlike many of his contemporaries and colleages, his education has not been mainly confined to the teachings of the pernicious "Red Flag" literature that now abounds. Still we have it from Mr. Shackleton's own lips that he is pleased and delighted that the trades unions have now left their old legitimate paths, and have diverted their interests into the ways that are bestrewn with the political and social questions of the present day. That is where many thoughtful men will join issue with the President. Far better would it have been, for labour and for the country, had trade unions kept themselves, as organized bodies, aloof from purposes other than those for which they were originally and specifically brought into being, and left the political questions to be dealt with by political organizations to which the individual worker could have freely given adherence according to his bent of mind and sympathies. There is not the slightest objection to labour being represented on the floor of the House by 53 members, if those representatives were at liberty to exercise their own discretion, and were not merely automatons whose actions are entirely under separate control. They may be sent to Parliament so as to voice the aspirations and desires of organized labour; there is nothing particularly objectionable about that, except that thereby their work in the House is limited to the interests of a single class, while the interests of all their other constituents are matters of almost absolute indifference to them. The aspirations and desires of the worker as represented by the majority of the labour party, are that all humanly begotten benefits shall go to the worker; and that is the essence of Socialism as understood by members of that party. Their creed can be further summarized by the one word, selfishness. It is impossible from observation—we are sorry for it—to endorse Mr. Shackleton's claim that a wider and more generous view is now taken by the party (the President used the words "trades unionists") of their duties as citizens.

The budget that Lord Rosebery denounces, in the plainest language, as being purely socialistic, is a *magnum opus* at the Trades Union Congress—in fact, it is the greatest financial reform of modern times. The revenue of this budget, Mr. Shackleton claims, shall go to the poor; while Lord Rosebery tells us that the budget, if it succeeds, will mean an increase in unemployment owing to the depletion of capital from which wages alone are paid. Sir Daniel Ford Goddard, one of the representatives of Ipswich in Parliament, and the Chairman of the Ipswich Gas Company, was among those who gave cordial welcome to the delegates at the Congress. In his welcoming speech, he remarked that he understood the delegates did not desire to destroy the peaceable relations which exist between employers and employed for the sake of spoliation or the picking of a quarrel. He also later extended generous hospitality to the delegates in the grounds of his own house. At an open-air meeting, held in connection with the Congress, Sir Daniel was described as one of "the products of the capitalist system." There need be no pointing of these comparisons, and exchanges of estimates of purposes and position. It may be courteous, but there is little use in taking a benevolent view of the objects of the Congress, and holding them up for veneration as being peaceable, now that the Congress has been changed into the largest socialistic platform yet constructed, and when throughout the proceedings there is every evidence of an implacable hatred of capitalists, a wild sowing of the seeds of discord, and the very men who have worked to provide capital for giving

employment are reviled for having capital in their possession. "Nature hath fram'd strange fellows in her time;" and some of them were to be seen and heard at the Congress. Without capital, where would labour be? There is only one answer. Yet the dissipation of capital, if many of the delegates at the Congress really meant what they said, would be the outcome of the programme of present-day Socialism. Mr. Shackleton spoke of the steps that have been taken, in conjunction with Oxford, to impart a higher education to working men, which "will give them a clearer knowledge of "the social, economic, and industrial history of the national "and local affairs of our country." This is to be welcomed, if it opens the eyes of the mind of the worker to the fact that war between capital and labour is not to the advantage of the country; and that the economic and industrial conditions of our land are not best served by such legislation as the Coal Mines (Eight Hours) Act, and that which is projected for enforcing a universal eight hours' working day.

Coal Stocks and the Outlook.

As the weeks pass, proof accumulates that the Coal Mines (Eight Hours) Act has been a huge error. Never has there been a measure within recollection that has had parallel with this in the creation of disturbance in a section of the industrial world. What will happen when the Act comes into force in Durham and Northumberland on New Year's Day is at the present time a nebulous matter. All may be well, or just the reverse. In many other coal areas, there have been, since June, strained relations between masters and men; there has been cessation of work at several collieries; recourse has been had to legal remedy over grievances; there has been legal reference in regard to the interpretation of sections of the Act (one of which as to the sixty hours extra working per annum is still in the balance); open rupture has occurred on questions of pay and other conditions; and above all there have been rumours and threats of a great national conflict, culminating in the immense parade of the miners' power over the Scotch wages difficulty. The Act scores heavily in its disturbing and perplexing influences; and the responsibility on those who introduced the measure, and forced it upon an unwilling country, is weightier than it must be pleasant for them to contemplate. Prediction by the adversaries of the measure has not been in any particular falsified by events. The smooth working that was prophesied by the Home Secretary has not been fulfilled. Reduction of output has been experienced; the degree of gradient to higher working costs has been greater than was anticipated; and still larger payment is being claimed by miners on the most slender of pretexts. Not long since it was expected that Wales would be in the throes of trouble through differences between masters and men; and though there was a settlement of the point then at issue, men and masters are again on the verge of a complete rupture. Discontent exists almost everywhere in the coal-fields; and that discontent is fomented by the men's leaders—in one way, by advice to lose no opportunity for raising the minimum wage.

There is no wish on our part to pose as, or to be deemed, alarmists; but we do say that, within the horizon of the observant, there are sufficient indications to suggest the wisdom of taking every precaution in respect of the coming winter's supply. It has been stated at several gas companies' meetings lately that the quantity of coal held in reserve has been above the normal owing to the unrest in the coal-fields; and some chairmen have spoken as though the need for this precaution has been extinguished by the acceptance of pacifying terms, over certain questions, in Wales and Scotland. That, it may be said emphatically, is a mistake. The revival of disagreement on fresh points in Wales does not encourage confidence; and, above all, there are the uncertainties as to what will happen when the Act comes into force on Jan. 1 in Durham and Northumberland, and generally through the recognition in the Scotch settlement of the principle of a higher minimum wage. Taking these matters into consideration, it would be the height of imprudence to yet reduce stocks to the normal level for the time of the year. Though finances might not allow the miners to continue a national strike for any length of time, a few weeks' complete stoppage, with the succeeding disorganization of supplies and transport, in the depth of winter would put not a few gas undertakings in a tight corner. It would then be every consumer for himself. The schemes to terminate industrial disputes without absolute rupture are many; but there may be occasions when even they will fail.

Specialization and Commercialism.

Writing recently in these columns on the subject of the distribution department, it was pointed out how important this has become in the making or marring of the fortunes of gas undertakings; and that the responsibility for the proper conduct of the department in all but the small undertakings is such that it requires at its head an officer who has specialized both technically and commercially in the work. A very thoughtful paper bearing upon the same subject was read, at the last annual meeting of the Illinois Gas Association, by Mr. Lucius S. Bigelow; and a few extracts from it are given in other columns. Mr. Bigelow has done an excellent part in advancing gas commercialism in America; and he is as keen as ever over the cause he champions. But he sees the danger of over-specializing in the commercial field as in the technical field. We are with him. Too rigid specialization, to the exclusion of all else, is not good either for the officer or the undertaking he serves. Sir J. J. Thomson, in his presidential address the other day to the British Association, spoke to the effect that premature specialization in one subject may produce remarkable knowledge, but it dulls enthusiasm; and no greater evil than to dull enthusiasm can be done to young men. Those words may well be applied to this subject of commercialism. The engineer specializing in a branch of the profession is the better for being a good commercial man; and a good commercial man who has also a technical knowledge of the work to which he has put his hand is a more valuable officer than the one who has not. The knowledge beyond the purely commercial or technical work as the case may be unconsciously produces an enthusiasm that is not experienced by the man who has rigidly specialized, and has possibly little value outside his special work. Take the salesmen, for instance, in gas show-rooms. We have found some who are skilful salesmen and charming talkers, but who, so far as their technical knowledge of the subjects of gas lighting, cooking, and heating goes, could be easily floored by a tyro in these matters, and could be made the butt of anyone interested in a competing agent. In specializing for gas commercialism, it is essential that the knowledge of the work should be thoroughly impregnated, and not merely veneered, technically. The commercial man with technical qualification has a large field before him; and his earning power should be good.

Gas Furnaces and Engines in Industry.

The competitors of town gas—suction-gas plant makers and purveyors of electricity—would have manufacturers believe that the use of town gas for industrial purposes is a decadent one. The statement must be seriously rebutted as frequently as it is unscrupulously made; and there is no better way of rebutting it than by securing the business—no matter how small the consumption— of providing heat and power for all industrial purposes to which gas is suitably applicable. It is surprising, the more one looks into this question of the application of gas to industrial purposes, what a number of diverse objects there are in connection with which gas can be of useful and profitable service. Sheffield, of course, is in an exceptionally favoured position in this regard; but a few sentences from the speech of Mr. Wilson Mappin at the meeting of the Sheffield United Gas Company the other day, illustrates the extent in that district of the field of industrial utility that gas has independent of power purposes. The Company are doing a considerable business in and through gas-furnaces; and about forty additional ones have been recently fixed. Among the purposes for which the furnaces are used are: Brass casting, silver melting, annealing dies, table-blade forging, bayonet forging, file hardening, testing steel, forging cutters, forging miners' drills, case-hardening, hardening chisels and twist drills, forging forks, forging files, tempering knives, &c. This is a pretty good chain of uses; but it is only representative—nothing more.

No one has more right to attention than Mr. Wilson Mappin when talking on this subject; and when he tells us that there is hardly a manufacturing firm in Sheffield who would not find it advantageous to use gas-furnaces for one purpose or another, then it may pay readers to pause and inquire whether his words do not apply—perhaps not in all cases in the matter of furnaces, but in other directions in which heat is required—to manufacturers in their own areas of supply. It was only the other week that the Chairman of the Commercial Gas Company (Mr. W. G. Bradshaw) was directing attention to the growing use of gas for the heating of crucibles in the East-end of London; and no doubt some

very interesting experiences could be quoted from numerous other districts throughout the country. It is, however, a business that requires cultivating and advertising. Manufacturers are, as a rule, difficult to wean from the customs and traditions of their operations. The Sheffield Company at all events are not going to miss this business for the want of advertising and demonstration. They have gas furnaces on show, to which manufacturers have been invited to bring material for the purpose of testing the capabilities of the furnaces. We had the curtain lifted on the gas business methods fostered by the Managing-Director of the Sheffield Company (Mr. Hanbury Thomas), in the presidential address of Mr. J. W. Morrison to the Manchester Institution of Gas Engineers at the end of last February (at which time reference was also made to the gas-furnace connections of the Company); and here we have another example of the wisdom and energy with which the gas business is being cultivated in this great industrial centre.

While the Sheffield Gas Company have an exceptionally good area for industrial business, they have also an exceptionally low price to offer; and this accounts for the continued growth of the power business. When Mr. Morrison was addressing the Manchester Institution six months or so ago, he only knew of one suction-gas plant in the broad supply area of the Company; and their power business continues to expand—the sale for motive power purposes during the last twelve months having been nearly 346 million cubic feet, which is an enlargement by some 14½ millions, while 29 additional engines were connected with the mains. Though this successful application of gas to industry is traceable to the already low price, the Company are not desirous of being tied to anything that may prohibit them taking the fullest advantage of all fresh economies in manufacture. Hence their intention to proceed by Provisional Order to have their standard of illuminating power reduced, with the application in testing of the "Metropolitan" No. 2 burner. It is the declared intention of the Company not to take full advantage of the new conditions. All they want is liberty to serve the interests of Sheffield in the most economical manner. They have done well by the city in the past; and this is the continuation of the established policy under the changed circumstances, and extended applications, of distributed gas.

"Metallic Filament" Gas-Mantles.

Much interest has been evinced in the article that appeared in the "Journal" for the 24th ult. (p. 503) announcing the arrival, though not actually on sale yet, of a metallic filament gas-mantle. At the time the description of the mantle appeared, we stated that there had not been an opportunity of seeing the illuminating effect of the mantle; but yesterday, just before going to press with this issue, Herr Reeser brought to the office a burner fitted with a piece of the metallic gauze fabric to give a little demonstration. The burner employed was an ordinary "C" one, with the primary-air chamber and inlets enlarged so as to give a greater supply of air—this being necessary with the metallic filament mantle. Though only a small piece of the fabric was used simply domed by the finger, and supported only by a collar round the top of the burner, the brilliance of the light was abundantly attested. After it was used, Herr Reeser pulled the fabric off, doubled it up, flattened it out, and otherwise unmercifully used it; and then replaced it on the burner, and ignited the gas again. The whole of this rough treatment had not produced a single fracture of the silk-like metallic filament fabric. It demonstrated completely its great flexibility and tenacity. About the ascribed useful life of the mantles, information was given in the article published on the 24th ult.; and an opportunity is going to be immediately afforded for putting the assertions to the proof, now that the necessary burners with larger air-supply are about available.

Pipe Depths.

In "Notes from Westminster" recently (*ante*, p. 166), reference was made to the unreasonable requirements of certain county authorities in the matter of the reinstatement of roads after pipe-laying by gas companies. There is a growing and also unreasonable requirement by County Councils in respect of the depths at which pipes shall be laid, and to which as much resistance as possible should be offered. This is an old sore point—dating from the introduction of the heavier types of steam-rollers. In the Aldershot Gas and Water Company's Act, it is noticed that the Surrey County Council have secured the insertion of a set of clauses for their protection. One of these enacts that any main, pipe, or other work of the Company constructed under the Act, beneath the surface of any road, street, or bridge, or other highway, "shall, if reasonably practicable, be laid or constructed at such a depth that not less, in the case of a pipe of 6 inches or upwards, than 3 feet, and, in the case of pipes of smaller diameter, than 2 ft. 6 in. shall intervene between the surface of such road, street, bridge, or highway and the upper surface of any such pipe, conduit, or work." For pipes 6 inches in diameter, a depth of 3 feet between the road surface and the top of the pipes, and for pipes of a less diameter than 6 inches a depth of 2 ft. 6 in. is both unreasonable and unnecessarily costly. Less cover would quite suffice, without running the Council into any particular risk. In another clause the Council arrange that they shall not be liable for any injury or damage done to any work of the Company authorized by the Act by reason of it being laid at a depth below the surface of any main road insufficient for its protection from injury by the use of any steam or other roller of reasonable weight, having regard to the nature of the subsoil for the repair of such road, or by the passage of the traffic in such road. The Council have here safeguarded themselves in a generous and elastic manner; but it would not have injured their dignity if in framing the clauses they had given a little recognition to the fact that the Company, as well as the County Council, are rendering public service.

Next Year at the White City.

Already Mr. Imre Kiralfy has commenced to prosecute his campaign for support for the Japan-British Exhibition next year, through which it is hoped to strengthen the already secure bonds that exist between this country and Japan. No doubt we shall all be happy to make closer acquaintance with the arts, products, and manufactures of our allies in the Far East, and they of ours. The Japanese Parliament, it is stated, has already voted 1,800,000 yen for the exhibition; and the Government of Formosa and the Local Prefectures have also voted large sums for the exhibition. If all that is promised reaches the stage of actuality, the exhibition will be a unique one, and consequently attractive to the country at large and to visitors from abroad. Any way, it should be something exceeding in merit and magnetism the exhibition of this year. From the information received from the exhibition authorities, we learn that the Japanese Government have already secured a large portion of the existing buildings and grounds; and a corresponding proportion of the remaining grounds and palaces has been thoughtfully reserved for a display of the arts, products, and manufactures of the British Empire. That is where our manufacturing readers come in; and the privilege of displaying their wares can be secured at the price of 6s. per square foot (including one frontage), and 10s. per foot for each additional frontage. A minimum charge for space of £20 is put upon individual exhibits, and £10 for collective ones. It is to be feared that, at this price, gas plant and appliance manufacturers will not give a second thought to attaching themselves to the White City for half next year; and we do not suppose that, whatever the price for space, a single holder, burner, cooking range, or fire would be sold in Japan in excess of what would otherwise be the case by exhibiting there next year. The exhibition will open on May 3 and continue to the end of October. If Dukes, Earls, Lords, Presidents of Chambers of Commerce and of certain learned Societies (but, with one or two exceptions, not of professional engineering societies), Lord Mayors, and Mayors, can make the projected exhibition go, then success is already assured; for, in addition to the Hon. President (Prince Arthur of Connaught) and the President (the Duke of Norfolk), the lists of Vice-Presidents and members of the General Committee are overflowing with the names of such notabilities.

Failure of a National Strike.

In spite of all efforts that may be made by the Labour party to deny it, there can be no possible doubt that the national strike in Sweden, which was expected—in some quarters—to accomplish so much for the workers, has ended in their disastrous defeat A member of the Swedish Parliament (Mr. C. Lindley) attended last week's meeting of the Trades Union Congress, and made a statement in which he confessed that, though Labour was well

organized in that country, they had found the Capitalist class able to strongly resist. The strike had commenced last month, and had involved nearly 300,000 men and women, including the organized and a large number of unorganized workers of the country. Mr. Lindley appealed for help to continue the struggle; and the Congress passed a vote expressing "full sympathy" with the strikers in their struggle, and recommending the appeal to the practical support of the Trades Unionists of this country. The strike apparently never became the "general" one the men's leaders desired, for several classes of workers in important branches of industry did not come out; and the citizens themselves by prompt action, were successful in spoiling plans which had been carefully laid for disorganizing the life of the capital. The lesson is one which should not be lost on others who may be dreaming of the efficacy of a national strike as a remedy for industrial grievances. If, as Mr. Lindley is reported to have said, Sweden is the best organized country in the world from the labour point of view, and yet crushing disaster has met the agitators there, the logical conclusion is that a similar strike could not succeed elsewhere. The cause assigned for the failure—the powers of resistance of the capitalists—is no doubt largely the correct one; but then who besides the misguided strikers could have questioned the fact that they possessed this power? Much misery has been entailed upon the workers and their dependants, and more will have to be suffered by them, in finding out a single truth, of which they had been assured again and again by those who could see more clearly than they could that a strike of such a character could not in any case lead to betterment of labour conditions. Revolutionary tactics might have been successful in permanently dislocating the industry of the country; but fortunately for everybody concerned, a feature of the Swedish strike has been the absence of organized violence.

The New Disturbance in South Wales.

As is remarked elsewhere, another trouble threatens the South Wales coalfield; and, in fact, to such a state have traders and others been wrought by the continued disturbances, that even one of the local papers remarks that "it is becoming increasingly clear that the sole satisfactory solution is to be discovered after all in a strike or lock-out." From the unsatisfactory relations between masters and men which have for a considerable time past existed in South Wales, the colliery industry has, says the newspaper referred to, "suffered to such an extent that it is the most natural of developments that a feeling is rapidly growing and spreading that a decisive conflict should be provoked, if necessary, to exorcise once for all the spirit of unrest which will render it impossible to make contracts at all if it persists much longer." As to whether this is the correct interpretation to place upon the latest move of the owners, we will not attempt to pass an opinion; but, whatever may be the underlying reason for the step, certain it is that the owners have cast something like a bomb into the camp of the men. Some days ago a circular was published by them, intimating that in a short time a resolution would be submitted at a meeting of the Coalowner's Association to serve notices on Oct. 1 either on all workmen employed at all the collieries connected with the Association, or only upon the workmen employed at collieries where the owners are unable to introduce an afternoon shift except by paying a bonus turn. It is explained that the men are prepared to work afternoon shifts on five of the six afternoons of the week; but they desire the sixth afternoon free, and payment at the rate of six turns for five turns work. If the notices are tendered, they would expire on Oct. 31. One can only regret that a paper which is published on the spot, and presumably is fully acquainted with all the circumstances, should feel compelled to conclude its reference to the subject by remarking that, "upon the whole the sharp and decisive settlement of the disturbance which would be the product of a strike is rather to be welcomed."

Steam Displaced by Gas and Electricity.—A new development, says "Progressive Age," quoting from a Washington paper, of greatest importance to the industrial world has been brought to light by the announcement that the United States Steel Corporation—the largest user of steam power in America, and perhaps in the world—have decided to consign all apparatus used for steam power to the "junk pile," and substitute modern gas and electric engines and motors. This change is based on the calculation that it will result in a saving of not less than 50 per cent. in the cost of power. Engines capable of producing about 1,250,000 H.P., propelled by gas, will have to be installed.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 709.)

Business on the Stock Exchange last week had one or two interesting and strongly marked features; but they were almost entirely limited in their influence to the more speculative departments. In the choicer markets, the rise in the price of gold was a factor in the earlier portion of the week; and the still unlaid Coal Mines ghost was a nervous element. The week opened very quietly, and with no particular tendency. The gilt-edged division and Home Railways were only moderately good, but the Foreign Market was firm; and the closing of New York eliminated a possible centre of the disturbance. On Tuesday came a change for the worse, with a heavy fall in Americans. This, coupled with the sinister factors mentioned above, caused a general weakness. Consols fell $\frac{3}{16}$. Wednesday was very quiet, and rather dull and sensitive; but a favourable item was the lightness of the fortnightly account, which gave rise to no anxieties. The greatest weakness was in American and South African lines. Thursday was perhaps a little less inactive without much change in tone. Bad weather seriously depressed Railways. On Friday, the absorbing feature was a big jump in Americans (all turning upon the death of the Railway King Harriman); and this seemed to cheer things in general up a bit. On Saturday, there was not much doing; but Americans contrived to hold on to their advance pretty firmly. In the Money Market, the supply was just as abundant as it had been for many weeks past. Discount terms hardened in view of the rise in gold, but eased down again before the close. Business in the Gas Market was unusually active for the time of year, and prices were very firm. A considerable number of quotations made some nice advances; and none moved in the opposite direction. In Gaslight and Coke issues, the ordinary was quite brisk, and, with transactions ranging from $104\frac{1}{4}$ to 105, had a rise of half-a-point. The secured issues were little dealt in; the maximum marking 88, the preference $104\frac{1}{4}$ and 105, and the debenture $86\frac{1}{4}$ and $86\frac{1}{2}$. South Metropolitan was also a little busier, and changed hands at from $119\frac{1}{2}$ to $120\frac{1}{2}$. The debenture made $85\frac{1}{4}$ and 86. In Commercials, the 4 per cent. was done at from 108 to 109 (a rise of 1), the $3\frac{1}{2}$ per cent. at 104 and $104\frac{1}{2}$, and the debenture at $81\frac{1}{2}$. Among the Suburban and Provincial group, Brentford old marked 253 and $253\frac{1}{2}$ (a rise of 1), Ilford "A" 142, ditto "B" 107 *cum div.* and $105\frac{1}{8}$ *ex div.*, South Suburban preference $120\frac{1}{2}$, ditto debenture $122\frac{1}{2}$, Tottenham "B" 112, West Ham $124\frac{1}{2}$, and ditto debenture $112\frac{1}{2}$. The Continental companies were extremely quiet. Imperial marked $179\frac{1}{2}$ and $180\frac{1}{4}$, ditto debenture $95\frac{1}{2}$, Union from $95\frac{1}{2}$ to 96, and European fully-paid 25. Among the undertakings of the remoter world, Bombay changed hands at $5\frac{13}{16}$, Buenos Ayres at from $13\frac{13}{16}$ to 14, ditto debenture at 95, Monte Video at 13 and $13\frac{1}{8}$, Primitiva at from 7 to $7\frac{1}{8}$, ditto preference at $5\frac{7}{16}$, River Plate at $16\frac{3}{4}$ to $16\frac{15}{16}$, San Paulo at $14\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

Recognition of the Limitations of Electrical Heating—A Radical Change Required in Method—Proposals—Electricity for Cooking and Water Heating—The Relative Scope of Gas and Electricity for Improvement—Cost of Electrical Appliances—A Board and its Administration—More Poor Financial Returns.

It will be remembered that a prescient writer attached to the staff of the "Electrician" predicted quite recently that cooking by gas is nearer to vanishing-point than most people imagine; but we find it very difficult to take such electrical prophets seriously. One day they are hilarious with joyful hope; another, deep in despondency. Time has just been spent reading a paper on "Electric Heating," by Mr. W. S. Hadaway, submitted to the American Institute of Electrical Engineers," together with the discussion thereon, as well as a comment by the "Electrician." The result of the perusal of this matter is an impression that our contemporary now makes a sort of hazy admission that all is not so well with electric heating as could be wished; that it and our electrical friends in America are persuaded that electricity, as an efficient and economical heating agent, has its limitations; and that the appliances are still far removed from ideal conditions. "In England," observes our contemporary, "we are wedded to the open fire; and the tendency has been, when electric heating is adopted, to simply replace this by radiators—*the results being by no means always what was desired.*" Exactly. That confirms our own trials and experiences, and corroborates statements in the "Memoranda" that have often been attacked and contradicted without sense or judgment. It is pitiful to see ascertained fact attacked by vain bluster and empty prediction.

Apart from experience, the paper and discussion assure us that there are restrictions to the effective use of electricity in maintaining an equable temperature in all but limited spaces during cold seasons, and that there must be a radical departure from the present designs of electrical appliances if there is to be a business cultivated in the heating of large spaces. As one speaker put it, if electrical heating is to be introduced upon the large scale into house warming, it will be necessary to accord to heating and ventilation more scientific attention than is now usually bestowed upon this class of work. In view of the concentrated character

of electrical heat, it was suggested that one way of utilizing it more effectually for warming purposes would be to employ an electric heater, and pass air over it for distribution throughout a house or other establishment as the case may be. Again, we venture to suggest that there are serious limitations to this mode of heating. To get the heated air well-distributed throughout a house would necessitate an expensive and a very well-designed conducting system; and the conditions the electrician has to meet to-day are not houses and other buildings with such a system incorporated in their structure, but houses and other buildings as they exist. Mr. Hadaway suggests the distribution of the exhaust steam from generating-stations for heating and general domestic use; and the adoption of electrical devices for other purposes in which concentrated heat is required. It is a pretty enough scheme on paper. But the cost of laying and maintaining a steam-distribution system throughout a town would stagger the most optimistic electrical engineer; and that, with the considerable heat losses, would make the scheme financially unworkable. On the whole, Mr. Hadaway is not very helpful in solving the problems connected with electrical heating; but two points are made abundantly clear by his review of the position and the discussion—that the field of economical electric heating is limited to devices in which the heat is usefully concentrated in a small area; and that, before any satisfactory progress can be made, there will have to be a complete change in the design of the appliances employed. In connection with the first point, Mr. Hadaway and one other speaker seemed to think that a more extensive and profitable use for electricity for heating will be found in the industrial, than in the domestic, field.

But there is not the same indication of any relinquishing of the ill-founded claim to the superiority of electricity for cooking purposes. In considering this matter, however, our electrical friends have an unconquerable difficulty in regard to the incomparable number of heat units purchasable for a given sum from gas and from electricity. The means of escape from this difficulty that has been adopted tickles one's risibility. It is assumed by our electrical friends that there is a loss of heat units when gas is employed to an extent not according with practice; and that there is a greater useful application of the heat units in an electric oven, which likewise does not accord with practice. They follow on with the assumption that the loss of heat units on the one side and the saving of heat units on the other about balances the two agents in the matter of cost. This is a simple argument that will not stand a practical test; but it may be specious and fanciful enough to arrest the attention of the householder. Mr. Hadaway was much more cautious than were some of the speakers on his paper. He said: "In modern apartment houses, electric lighting is available, but low heating efficiency is found in cooking, except in cases where gas is available. No one can question the value of gas as a fuel in cooking." And in another place he said: "A circular gas-burner will impart heat at a rate equivalent to 35 watts per superficial square inch. Electric stoves made for 110 volts will work at about one-third this rate."

Electricians usually seem to imagine that the ultimate efficiency of gas fires and cookers has been reached. The mistake may give passing but not lasting gratification. Generally speaking, we may claim that the gas cookers and the fires made by British manufacturers are in advance of those produced in America; and as between the thermal units available, for a given outlay, from gas and electricity, there is a large margin in favour of gas upon which to make further progress. Accepting 3412 B.Th.U. as equalling a unit of electricity at 1d.; and taking a net calorific power of 500 B.Th.U. per cubic foot of gas, at 2s. 6d. per 1000 cubic feet, 1d. will purchase 16,500 B.Th.U. From which is seen the possibilities—let alone what now actually exists—of gas as a heating agent, and the scope that remains for effective improvement. In the discussion on Mr. Hadaway's paper, Mr. Loewenthal stated that "in a gas-stove, the ventilating current required for the operation alone consumed at least 80 per cent. of the heat units obtained by burning the gas;" while "in the case of the electrical oven more than 90 per cent. of the heat energy could be utilized." We deny entirely the accuracy of the 80 per cent. requirement for ventilating current in the gas-stove. In the Leeds University tests with gas-fires, only about 30 per cent. of the heat generated in the stove used passed into the flue; and we should be curious to learn the reason why nearly three times this amount is required for a ventilating current in the case of a cooker. The fact is this is pure assumption on Mr. Loewenthal's part. But if we accept his figures—taking gas at the high price of 4s. and electricity at the low one of 2·5 c. per kilowatt-hour—it is seen that the operating costs, for the heat units usefully employed, will be practically identical; but then (according to him) 90 per cent. of the heat units of the electricity has been utilized, and only 20 per cent. of the heat units of the gas. The moral is that there is a big scope for improvement in the utilization of gas, and a precious small one in the case of electricity. As opposed to Mr. Loewenthal, the results of practical trials made with gas and electrical cookers by the Davis Gas-Stove Company, and reproduced in our columns on April 20 last (p. 166) and on May 4 (p. 296) may be quoted. The figures given in the latter place refer to the heating of water respectively by gas and electricity, in which figures it was shown that, in the competition for this purpose, electricity is entirely out of the running. It is admitted by all electricians who know what they are talking about and refrain from rash statements, that there is no present method by which water can be heated economically by electricity. Taking electricity at 2½d. per kilowatt-hour, said one speaker, in the discussion on Mr. Hadaway's paper, the cost of heating a gallon of water to boiling point, at an efficiency (say) of 80 per cent., is little more than 1d., which to many people is a prohibitive price, "as the same results can be accomplished with gas at very much less."

There is something else besides the low heating value of electricity that obstructs the progress of electrical cooking and heating—and that is the cost of the appliances. A writer in the "Electrical Times" has compiled a list, showing the reductions in the prices of electrical appliances that have taken place during the past two years—we suggest because there was little or no custom at the old figures. The prices cannot be called moderate in comparison with gas appliances. One maker offers a 3000-watt oven at £9; another, a 2400-watt one at £10; and a third, a 1500-watt one at £5 5s., which prices do not include fitting up and special wiring where a lower price than for lighting is charged for cooking. A four-lamp radiator (consuming a unit of electricity an hour) can be obtained now for £2 2s. A 2-pint tin kettle is purchasable at 10s.; a 1¾-pint copper kettle at 15s. 6d.; and a 1½-pint brass kettle at 18s. 6d. Another maker offers a 2-pint tin kettle at 7s. 6d.; and a copper one of similar capacity at £1 8s. 6d. A third charges 10s. and 18s. respectively. A 4-lb iron is on sale at 12s. 6d.; a 5-lb. one at 21s.; and an 8-lb. one at 23s. Several other appliances are mentioned; but their capacities are not stated. The supplier of these particulars says: "It should be borne in mind that it is not so much the cost of the electrical details which governs the list price, but the work put into the outer metal case, and the value of the metal itself. Owing no doubt to the class of demand in the past for electric heating apparatus, the material and finish have been maintained, perhaps, at an unnecessarily high standard." Not "unnecessarily." In the case of electric ovens, the metal and the casing must be maintained at a high standard, if there is not to be considerable heat loss by radiation, and that is a loss which, in the competition, electricity cannot afford.

Dealing in last week's issue with a number of municipal accounts, reference was made to the deficit on the working of the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board. Attention has been called by an electrical contemporary to the fact that the generating costs of the Board eclipse all other records; being only 0·37d. per unit. Also that the average rate of charge by the Board is the lowest. But it is not pointed out how unfairly this low average rate of charge has worked on the gas undertakings of the local authorities and on that of the Hyde Gas Company, all of which are competitors and ratepayers; nor how hardly it has operated on the general body of ratepayers. This will be seen by extracting from the financial records the deficits on the working for the past five years—

	Tramways Department.		Electricity Department.
	£		£
1905	4,484	..	3 266
1906	9,950	..	5,908
1907	9,612	..	6,083
1908	8,189	..	5,466
1909	10,381	..	463
	£42,616	..	£21,186

From which it is seen that the enforced contributions of ratepayers to the support of the Board's undertakings have been no less than £63,802 in five years. The Board object to their affairs being criticized. One member of the Dukinfield Town Council the other day sought some information; and he was told that he might have got what he wanted without (as it were) setting the town on fire, and creating such an amount of curiosity as though there was something wrong being done. As spectators of what is going on, it seems to us there is something wrong that should be righted; and it is that the charges should be so rearranged that the ratepayers should not be called upon again to bolster up the Board and undertakings hitherto run on uncommercial lines, and that the thousands upon thousands of pounds wrongfully taken from the ratepayers in the past should be refunded. Only agitation will accomplish this in the case of a Board whose business principles do not comprehend the protection of ratepayers from an unjustifiable burden; and those who are courageous enough to start and maintain such an agitation until success is achieved would deserve well of their fellows.

While on this subject, the figures and other particulars published last week as to deficits and small net profits on municipal electricity accounts for the last financial year may be supplemented. In the case of Acton, the deficiency, after providing for the repayment of loans and interest, was £4943, compared with £2934 the previous year. But 70,597 units more were sold, though the total income was less by £118. This peculiar position is accounted for by, first, the fact that the public lighting by electricity has been discontinued, for which the ratepayers were mulct at the rate of 4d. per unit, and, secondly, that the power units sold have largely increased. These changes have reduced the average price per unit from 3·88d. to 3·33d., or 0·55d. per unit less over all the electricity sold. The effect of the loss of high-priced units, and the gain of low-priced ones, is well illustrated here; and this effect is showing itself among the undertakings throughout the country. Loughborough only obtained a balance on revenue account of £547, with the result that a grant of £1500 has had to be made from the rates, and an adverse balance of

£2346 has been carried forward. The Redditch undertaking also ended the year with a deficit of £2368. To the list of lean surpluses published last week, there has to be added Aberdeen with a net profit of only £227. It was stated last week that the net profit at Nelson figured at £36; but it may be added that the Manager of the department states, in connection with the metallic filament lamp, that a larger number of meters has had to be seen to than formerly, owing to the small amount of current used by the metallic filament lamps not always producing a true reading on the registration dial. Many other central station engineers, to their cost, know that their colleague's experience is not singular.

ILLUMINATING ENGINEERING SOCIETY.

A circular has been issued by the founders of the Illuminating Engineering Society—a Society formed for the study of the science and art of illumination—in which attention is called to the "influential support received from many distinguished authorities on matters of illumination in this country, on the Continent, and in America." The founders of the Society have spread their net far and wide with the view of securing the adhesion of men of position in the realm of illumination, and enrolling them as Vice-Presidents or as corresponding members. Although it is mentioned that the names of only a "few of those" who have expressed sympathy with the movement in this manner are given in the circular, it may be supposed that the list includes the names of the most renowned men who have accepted the offer of such honour as attaches to the printing of their names as Vice-Presidents. Of the twenty-three names published, seventeen are those of gentlemen abroad; and only six are of Britishers—among the latter, the only name identified with gas lighting being that of Professor Vivian B. Lewes. The six Britishers are: Sir William Crookes, Sir William Preece, Sir Boverton Redwood, Sir H. Trueman Wood, and Professors J. A. Fleming and Vivian Lewes. Among the names from abroad that are well known to, and esteemed by, our readers are: Professor H. Bunte, M. Sainte-Claire Deville, Professor H. Drehschmidt, Dr. A. H. Elliott, Dr. E. Schilling, and Professor H. Strache. Professor Sylvanus P. Thompson, D.Sc., F.R.S., has consented to become the first President; and, it is stated, "a very representative Council has now been formed." The active work of the Society commences in November.

Our Street Lamps.

There is reproduced under this heading, in the "Builder," the following paragraph which appeared in their issue of Sept. 10, 1859: "Things constantly before our eyes become so familiar that we are liable to pass them by without any particular attention, although, if persons of educated taste had some of these objects put before them for the first time, they would be surprised at their deformity, and wonder how such things could have been so long tolerated. Among the most conspicuous objects in the streets of the Metropolis are the thousands of lamp-posts which line the highways, and are distinctly in view during both night and day. A glance at one of these, which may be taken as a type of the majority, shows that it has been constructed without attention to any principle of design. It is neither beautiful in form nor symmetrical in its proportions. It is a matter which might have been planned, as no doubt it was, by some ordinary mechanic, who had no knowledge of, or feeling for, art. Yet, for more than half-a-century, since gas put out oil, the same form, with scarcely a shade of change, has continued to be manufactured in thousands, not only for the use of the Metropolis, but also for the provincial towns; the same description of lamp is reared on the same pattern of pole in remote villages, in the railway stations, and in British possessions abroad. The shape of the street-lamp is as strictly adhered to as if it were a matter of caste in India. In connection with our public buildings, where the skill of the architect has been called in to devise the form of the gas-lamps, the improvement has been great. The chief lights at Buckingham Palace have a handsome appearance, so have those within the railing of the British Museum; and at the Houses of Parliament the lamps are of artistic design, and in harmony with the architecture. Some say, 'What can you do with a lamp-post?' An inspection of some of those to which we have referred will of itself show that elegance can be imparted to what are generally considered matter-of-fact objects."

The twenty-eighth annual convention of the New England Water-Works Association was held at the Park Avenue Hotel, New York, from Wednesday to Friday of last week, when the opportunity was afforded members to visit the Ashokan dam and other important water-works undertakings. In connection with the convention, the associate members had an exhibition of water-works supplies.

At a meeting of the Dublin City Council, Alderman Reigh proposed the adoption of a vote of sympathy with the family of the late Mr. Thomas Cotton, Gas Inspector under the Corporation. The Alderman stated that Mr. Cotton was an able, efficient, and conscientious officer. He was born and educated in Dublin, and had been a good citizen. The Corporation had lost by his death one of their best officers. The motion was passed.

TRADES UNION CONGRESS.

Meeting at Ipswich.

There was much doing at Ipswich last week; for it was in this town that the Trades Unionists had decided to hold their forty-second annual congress, and there they duly gathered to the number of 497. A busy time had been anticipated; and this expectation proved to be fully justified. In fact, there never is any lack of discussion at these meetings, though it must be admitted that generally not all of it is of a strictly practical nature. This may be once more said of last week's congress, which in many respects was extremely like its predecessors. Similarity, however, is no more than can fairly be expected, seeing that to a large extent the problems which confront, and the ambitions which assail, the Labour leaders must remain the same. Not while the world and human nature remain as at present, are the one likely to be entirely settled or the other to be completely satisfied. There are limits to what can be accomplished even by organized Labour; and the more the delegates to the congresses kept within those limits, the greater would be likely to be the good resulting from their efforts. But the question would doubtless arise as to just what the limits were; and here at once there would be disagreement, for the Trades Unionists have certainly an altogether more extensive belief in their own powers than is shared by their critics. Thus there seems nothing for it but to go on as at present—considering annually a number of resolutions, some of which may bear good fruit, but more of which might as well never have seen the light of day for all the practical results that can come of them. Six days of last week were occupied by the delegates in their business; the meeting breaking up on Saturday. The first thing to be done on the Monday morning was to welcome the members of the congress to Ipswich; and this was undertaken by the Mayor (Mr. F. C. Ward) in an excellently worded speech—concluding with the hope that the labours of the delegates might be for the good of those they represented and all classes, for the furtherance of industrial peace and prosperity, and for the welfare of this country and the Empire at large. The work of welcome was also shared in by the Borough Members—Sir Daniel F. Goddard and Mr. Felix Cobbold—and thereafter the business was taken in hand.

The opening item, of course, was the Presidential Address of Mr. David Shackleton, M.P., who occupied the chair. In the statistics which he was able to quote, it was pardonable that both he and his hearers should have felt satisfaction. The last meeting of the congress held in the Eastern Counties was at Norwich in the year 1894; and there were present 372 delegates, representing Trades Unions with a membership of 1,035,000. On the present occasion, the 497 delegates represented Unions with a membership of 1,701,000, and included 33 Members of Parliament, 26 Justices of the Peace, 2 Mayors, 6 Aldermen, and 18 Councillors. To-day Trades Unionism and Labour has no fewer than 53 representatives on the floor of the House of Commons, voicing the aspirations and desires of organized Labour. In the opinion of the President—and many people will agree with him—no Act of Parliament has given greater satisfaction, brightened more homes, and gladdened more hearts than that which bestows old-age pensions on the poor. It was not the desirability of the Act, but the cost of carrying into effect its provisions, that was the chief subject of criticism before it passed into law; but increased outlay does not trouble the Labour representatives one little bit. The cost can be so easily met, according to their theory; all that is necessary being to make the landlords pay their "fair share" of taxation. However, good as the Old-Age Pension Act is, Mr. Shackleton sees one blot upon it—the bar of Poor Law relief. The removal of this disqualification is to be earnestly sought. It will, of course, add still further to the cost of the Act; but the President perceives "in the Budget the possibility of further revenue." Evidently he is a long-sighted man. Some credit is taken in the address for the fact that a Bill for dealing with the evils of sweating on lines which have from time to time been advocated by the congresses has been passed into law by the action of the Government. This is the Trade Boards Act, which provides for an impartial court, where both employer and employed can be heard. So far, the measure is merely regarded as an experiment, and thus its operation is confined to a few trades. There is foreshadowed in the address the probability of the question of insurance against unemployment forming part of the work of the next session of Parliament; but this is entering into the realm of speculation. Of more immediate interest are Mr. Shackleton's remarks on the desire for higher education among working men. These were as follows: "It has been my privilege for nearly two years to work on what is known as the Joint Committee of Oxford and Working Men. It has been a source of considerable pleasure to have had most enthusiastic support from the University men at Oxford in bringing into being what are known as tutorial classes. Our first year's work was confined to two centres—Rochdale and Swindon. The character of the papers sent into the examiners was of the highest order; some of them being considered equal to the best work done at Oxford. Our last session was conducted on a more extensive scale; and I am pleased to say the results of the examinations were exceedingly satisfactory. We commend these classes to the generous consideration of all local Education Authorities, and Trade Unions, Friendly Societies, and Co-operative Societies. The advantages of the system are close personal touch between teacher and student, full opportunity of question and

nswer after each lecture, and, above all, the opportunity of bring- ıg a large number of young men and women under the best tui- on, and on those subjects which the class decides shall form part f their curriculum. We hope before long to have classes in every entre of industry; and from among the present students many apable and efficient teachers will arise. From these young men, ill come the future leaders of the Trade Union and Labour novement. They will come not only with the practical experi- nce of the factory and workshop, but with a sound theoretical nowledge of the social, economic, and industrial history of the ational and local affairs of their country, which will more fully quip them for the ever-increasing duties and responsibilities which n active life among the workers of this country demands."

The Parliamentary Committee's report—always a bulky portion f the matter submitted to the consideration of these congresses -on the present occasion took the form of a pamphlet occupying o less than 56 closely printed pages; and the very first para- raphs contained a statement that is greatly open to question. 'his was to the effect that the Mines Eight-Hours Act had in ome parts of the country caused a good deal of friction which 'as happily now settled. From this one might be led to suppose hat friction is at an end; whereas in reality a most disturbed ondition of affairs still exists. A resolution having been moved ı Parliament by a Labour Member altering the fair wages clause ı Government contracts, the Government submitted a clause of heir own, which was ultimately accepted. As a guide to local uthorities and others who have not yet such a Trade Unionist lause in operation, but still may be desirous of inserting one in heir contracts, the Government conditions may perhaps be here eproduced: "The contractor shall, under the penalty of a fine r otherwise, pay rates of wages and observe hours of labour not ess favourable than those commonly recognized by employers nd Trade Societies (or, in the absence of such recognized wages nd hours, those which in practice prevail among good employers) ı the trade in the district where the work is carried out. Where here are no such wages and hours recognized or prevailing in the istrict, those recognized or prevailing in the nearest district in 'hich the general industrial circumstances are similar shall be dopted. Further, the conditions of employment generally accep- ed in the district in the trade concerned shall be taken into ccount in considering how far the terms of the fair wages clause re being observed. The contractor shall be prohibited from ransferring or assigning, directly or indirectly, to any person or ersons whatever, any portion of his contract without the written ermission of the department. Sub-letting, other than that which ay be customary in the trade concerned, shall be prohibited. 'he contractor shall be responsible for the observance of the fair 'ages clauses by the sub-contractor." Many other matters were ealt with by the Parliamentary Committee in their report. In act, they themselves remarked that it might be claimed that uring no previous period in the history of the movement had the 'ork to be transacted by the Committee been of a more varied or ıteresting character than during the past year. To all these ther questions, however, we have no space or particular inclina- on here to refer.

The second day's proceedings consisted largely of a violent ttack on Mr. Richard Bell, M.P., who enjoyed a short but no oubt sweet period of notoriety some time ago when a general trike of railway employees was threatened. A resolution was roposed condemning Mr. Bell not only for having failed to sup- ort his colleagues during a debate in the House, but for making speech "which assisted the North-Eastern Railway Company in heir attempt to arrogate to themselves the privilege of deciding 'hich of their employees should be allowed to belong to a Trades 'nion," and instructing the Parliamentary Committee not to ndorse the candidature of Mr. Bell at any future election, and alling on all Trades Unionists to decline to give him their support. Ir. Bell offered an explanation, expressed regret again and again, nd admitted that he had been indiscreet; but the mover could ot be prevailed upon to withdraw his resolution. A way out of he difficulty was, however, eventually found; an amendment hat the apology be accepted being carried by an overwhelming ıajority. Mr. Bell thus escapes the ostracism which the adoption f the resolution would have thrust upon him; but the extent of he "moral damage" which he has in consequence suffered has et to be seen.

The Salvation Army having been condemned for sweating and nderselling in connection with a joinery works, members settled own to consider a motion dealing with another sort of army— he Territorials. The resolution expressed emphatic condemna- ion of any indirect or direct compulsory enlistment of the work- ıg classes into the Territorial forces, and also condemned the egulations which permitted these forces to be used in suppressing rade disputes. Further, it asserted that, as militarism and the xistence of standing armies constituted a menace to popular berty, a citizen army free from military law in times of peace 'as the best alternative to the class-biassed policy of the present overnment. The resolution was not altogether clear in its erms; but the idea of its author was that the Territorial Army cheme was playing deliberately into the hands of the Conscrip- onists. He ridiculed the idea that the Army was a voluntary ne, and said that what was wanted was a citizen army free from ıilitary control. The delegates seemed to be men of peace ıdeed; for they did not want even "a citizen army free from ıilitary law in times of peace." The second clause of the motion 'as deleted, and the remainder was adopted *nem. con.* Judging from some of the speeches made, the Trades Union Congress are of opinion that peace can best be assured by depriving oneself of all means of defence; but fortunately for the Empire, this view is not as yet universally held here.

Once more the congress have "called upon the Government to appoint a Minister of Labour, with full Cabinet rank;" and they have expressed disagreement with the importation and exportation of blacklegs during disputes. The delegates also concurred (though only by a small majority) in a suggestion that the Government should be urged to amend the Workmen's Compensation Act so as to make it definite who are the dependants in any case of loss of life, and to make the liability equal in the case of single and married men. No system of Labour Exchanges will be satisfactory to the congress unless Boards of Administration are composed equally of representatives of recognized Trade Unions and employers, with a neutral Chairman appointed by the Board of Trade; unless provision be made to prevent the Exchanges being used to undermine Trades Union rates and conditions of working by supplying labour at less than the Union rate; and unless it is provided that under no circumstances shall the Exchanges be used as agencies for the supply of labour to assist any firm who may have a dispute with their workpeople. The next resolution urged upon the Labour Members in the House of Commons to take up at once the question of the eviction of workmen and their families from their homes during trade disputes, and do everything in their power to get the Government to pass into law a measure that would "put an end to this cruel and inhuman method of warfare." By way of a change, the delegates declined to pass a motion suggesting that the time had arrived when the Government should consider the propriety of making grants-in-aid to trade organizations supporting their members during periods of slackness by the payment of out-of-work benefit. The opposition to this proposal was based upon the ground that, if carried into effect, it would sap the independence of the Trades Unions. A better reception naturally met a resolution that the old-age pension should be available at 60 years, instead of 70, together with the removal of all disqualifications. The almost unanimous vote in favour of a motion in support of the land clauses of the Finance Bill was preceded by the following unkind remark from a delegate: "You'll pass this resolution because there is no limit to the stupidity of a Trades Union Congress." The eight-hour day met with the usual support; but the delegates firmly declined to be "of the opinion that the time has arrived for conferring compulsory powers on the Board of Trade to inquire into any industrial disputes when requested by either party—pending such inquiry and report, no strike or lock-out to take place." The members did not appreciate the idea of thus taking away the power of the Union to strike the employer at the time that seemed to them most suitable. The idea of a minimum wage was approved.

The delegates separated, after having decided to meet next year in Sheffield. When that time arrives, there will no doubt still be plenty left to discuss; for the Government are hardly likely meanwhile to have carried into effect the very generous programme set out for them at this year's congress.

Classes in Gas Engineering and Supply.

From a proof-sheet of the "Co-Partnership Journal" which we have received from the Editor, Mr. W. T. Layton, we are able to give the following full information with regard to classes in gas supply, &c., for the session 1909-10, in connection with the City and Guilds of London Institute. Polytechnic, Regent Street, W. Classes in Gas Engineering and Manufacture, Tuesday and Wednesday evenings: Ordinary (Wednesday), 7 to 8.30; Honours (Tuesday), 7 to 8.30. Teacher, Mr. R. H. Collins, Assoc. M.Inst.C.E. Fee for session, 10s. 6d. Goldsmiths' College (University of London), New Cross, S.E.: Classes in Gas Distribution, Thursday evening: Ordinary, 7.30 to 8.45; Honours, 8.45 to 10. Teacher, Mr. T. Holgate, M.Inst.C.E., F.C.S. Fee, 7s. 6d. Woolwich Polytechnic, Market Street, S.E.: Classes in Gas Engineering and Supply, Monday evening: Gas Engineering, 7.25 to 8.25: Gas Supply, 8.30 to 9.30. Teacher, Mr. Holgate. Fee—one subject, 7s. 6d. (including Chemistry and Mathematics); both subjects, 12s. 6d. Battersea Polytechnic, Battersea Park Road, S.W.: Classes in Gas-Fitting, Monday, Thursday, and Friday evenings, 7.15 to 9.45. Teacher, Mr. H. A. Wall. Fee, 10s. Westminster Technical Institute (L.C.C.), Vincent Square, S.W.: Classes in Gas Supply, Monday and Tuesday evenings, 7.15 to 9.30: Monday, Ordinary; Tuesday, Honours. Teachers in the Ordinary Grade, Mr. P. Smithers and Mr. H. Rothwell. The instructor in the Honours Grade has not so far been appointed. Fee, 10s. Tottenham Polytechnic, South Tottenham: Class in Gas Supply, Friday evening. Teacher, Mr. Holgate.

The "Journal für Gasbeleuchtung" reports the death on the 11th ult. of Herr Julius Jürgens, who had since the year 1885 been Manager of the gas and water works at Einbeck.

At a meeting of the Executive of the East Aberdeenshire Liberal Association held on Saturday it was agreed unanimously to recommend that Mr. W. H. Cowan, M.P., should be the Liberal candidate at the next election. Mr. Cowan, who was present and addressed the meeting, represents the Guildford Division of Surrey in the present Parliament.

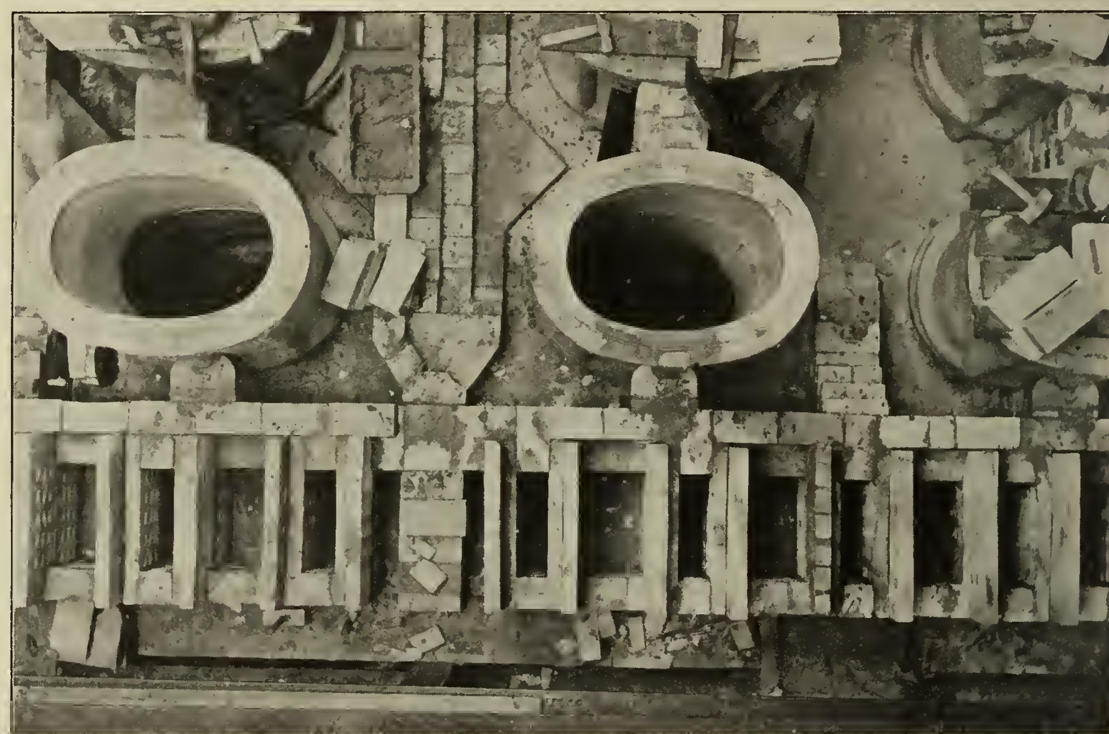
THE WOODALL-DUCKHAM VERTICAL RETORTS AT KENSAL GREEN.

A Forty-Retort Installation.

At the Kensal Green works of the Gaslight and Coke Company, the largest installation on the Woodall-Duckham continuous vertical retort system yet erected is now nearing completion; and the settings will be ready to commence the production of gas by the middle of November. Very shortly afterwards, the installation of settings now being constructed for the Burnley Corporation will be commencing manufacturing operations; and this will only be short of the size of the Kensal Green installation by a single setting of four retorts. But this week attention is confined to the Kensal Green plant, which is the result of the excellent experience with the comparatively small trial installation that has been in operation now for some time at the Nine Elms station of the Gaslight Company, and the working of which has been keenly followed by the Company's Chief Engineer (Mr. T. Goulden) and the Works Engineer (Mr. T. S. Lacey). There need be no stronger testimony of the views formed, by direct experience, by Mr. Goulden as to the Woodall-Duckham automatic system of continuous carbonization than this larger installation of ten settings of four vertical retorts, which it was our pleasure to inspect in their nearly complete stages last week. If any finishing touch be required to the evidence already accumulated as to the successful working of the system, this Kensal Green installation will give it; for the auxiliary plant allocated to the new producing plant will represent in effect a complete gas-works from carbonization to metering and storage. In this way, there will be no loophole for inaccuracy; and the scope for definite and reliable tests will be as broad and wide as it is possible for it to be. And of this we may rest assured, that the Works Engineer (Mr. A. S. Baker) will not leave a stone unturned to find the full worth of the system from the plant that it is his privilege to have placed under his charge.

Roof Alterations.

The new plant occupies a part of one of the old retort-houses at the station. The only alteration to the house that was needed for the benches was to the roof, a portion of which is carried by the buckstays of the new settings. Partly to this roof alteration is due the arrangement of this first installation of vertical retorts in two lines—that is to say, five settings in each row—as the scheme for carrying a part of the roof off the buckstays could not have been effected had the settings been constructed in a single line; and it is naturally the desire of the Company's advisers to, even in the larger installations, proceed tentatively. The walls of the house have not had to be raised at all; and the roof itself, or rather the ridge of the roof, is very little higher than it was before—indeed, practically all that has been done is to make more room between the principals. Not much work was occasioned by this.



Plan on Section Length of Woodall-Duckham Settings at Kensal Green.

The old roof was stripped; and the new arrangement of roof sets on the same bed-plates as before.

The Settings and the Ground Space Occupied.

The retort-house is 65 feet wide; and the part of the ground now occupied by the Woodall-Duckham settings had previously upon it a central bench of five settings of nine horizontal retorts. The same ground space is now tenanted by the ten settings of four retorts, arranged in two parallel blocks of five settings, with a central space of 9 feet between them; and there is still a good margin of working room round the settings. So that, with the new compared with the old, the economy of space is considerable. As a matter of fact, the producing capacity of the ten vertical settings will be 1,250,000 cubic feet of gas a day, which is double that of the settings displaced. The point need not be laboured to show its importance where a site is circumscribed, and there is no spare room for extensions on the old system.

The length of each bench of five settings is 55 feet. The settings are 10 feet centres; and the depth from front to back between the buckstays is 17 ft. 6 in. The whole of the settings and the producers are carried 9 feet above ground level (at Nine Elms the latter are at ground-level) on a bed formed of 14-in. by 6-in. rolled steel joists, with concrete filling. The buckstays not only serve as binders to the settings and producers, but they also carry the coal-hoppers, conveyors, and roof. The whole of the upright and girder work is of substantial character. The height from ground level to the top of the retorts is 35 feet, and from that point to the top of the coal-hoppers 12 feet; so that the over-all height (including the 9 feet clear below the settings for the discharging operations) is 47 feet.

The forty retorts comprising the installation are 25 feet long and 21 in. by 9 in. at the top, expanding to 29 in. by 20 in. at the bottom. The combustion chambers are situated round the top 5 feet length of the retorts; and access to each chamber is obtained by manholes in the front of each. The gases descend from there to the bottom of the settings—the hottest part of the retort being at the top where the coal enters, and the temperature declining to the bottom of the retort. As previously mentioned, the producer is raised above the ground-level; and the back wall of the producer now forms one of the side walls of the setting. The regenerator is located in the wall on the reverse side of the settings. Each bed has a separate generator and chimney; the latter being rectangular in section to within a few feet of the roof, and then continued through the latter by a circular extension. The regulation of the heat to the settings is accomplished by dampers on the hot secondary air and primary gases just before they meet at the nostrils. There are four sets of nostrils situated just below the combustion chamber level; and the gases are mixed in a chamber just before reaching the retorts. The regulation of the heats with these settings is an extremely simple matter; and it has not been found that the temperatures vary, or that they require special watching.

Coke Extraction.

As is well known, in the Woodall-Duckham system the whole of the coke discharging is accomplished mechanically; and as upon the speed of discharge depends the rate of travel of the coal through the retort, we will briefly refer to the coke-extracting part of the setting before dealing with the charging device. The principles of the apparatus for the extraction of the coke are the same

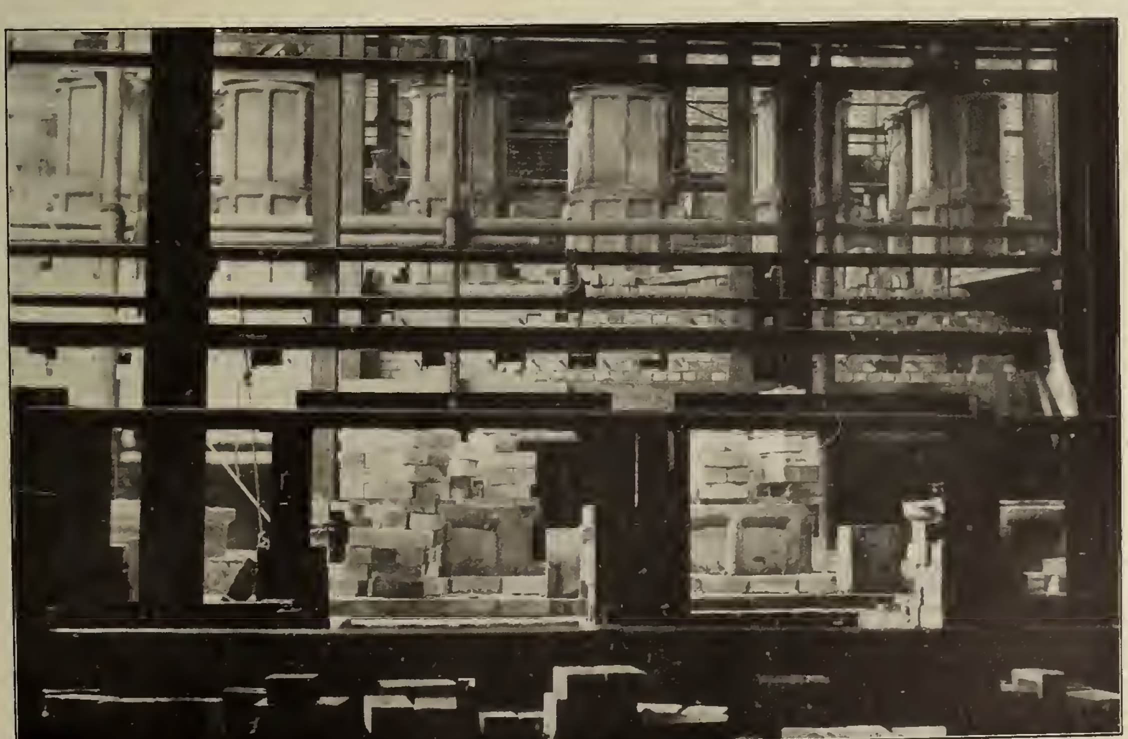
Elevation of Bottom Length of the Kensal Green Settings.

ıs are incorporated in the plant at Nine Elms; but an improvement has been effected, in that the discharging apparatus is perfectly gas-tight, and is more readily accessible for cleaning purposes. Running generally over the coke-extracting apparatus. At the bottom of each retort (and each retort by the way is a separate entity from the feed to the discharge) is a cast-iron hopper with one side sloping, which side takes the weight of the charge in the retort. At the bottom of the slope is fixed a wheel with helical blades, which, as it revolves, discharges the coke in small quantities from the retort into the hopper beneath. This hopper is in the form of a faced drum, which receives the coke, and in its turn automatically discharges it into barrows or conveyors. The speed of the extractor is 1·2 revolutions per hour; while the discharging drum makes 5 revolutions an hour. The extractor speed is variable at will; and the speed to which it is set governs the rate of carbonization. There is one point upon which there appears to be some little doubt in the gas profession, and that is as to the power required to operate the extractor-roll. There need be no question regarding this. The pressure of the coke on the extractor is, indeed, so small that it can be easily operated by hand, as well as by any machine. Standing under the retorts, it is interesting to see the four lines of ten coke-hoppers, with their discharging-drums. They are strongly built; the drums fit true; and, wherever one looks, it is noticed that strict observance of the correctness of every detail has been a feature of the erection.

The installation includes a gas-driven electricity generating plant; and each block of settings will have its own 6-horse power electric motor for driving purposes. A shaft is supported by brackets on the main uprights; and to this the extractors and discharging-rolls are connected by gearing.

Accessibility.

Proceeding from the ground level, it must be said, in passing, that we like the ample and safe provision made for reaching all parts of the settings. Strong stairways, with chequer-plate treads, lead from platform to platform. The first reaches to the clinkering platform at the 9 feet level (with the outer side railed in) for the two blocks of settings. The platforms are also floored with chequer-plates. On the producer sides, hinged doors are provided in the platform (in range with the clinkering-doors), through which the clinker can be deposited direct into trucks at the ground



General Elevation of the Kensal Green Settings.

General View of the Two Blocks of Settings under Construction.

level. From this platform a second stairway leads to the producer-charging floor; and a third similar stairway carries one up to the retort-feeding floor.

THE COAL-FEEDING ARRANGEMENTS.

On the top of the benches little is found that is different from what has been previously described in connection with the system, and the smaller installations of the plant. The retorts are finished with cast-iron mouthpieces, to which are attached the rotary drum feeding devices and the gas take-offs. The feed of the coal, as explained earlier, is entirely controlled by the extraction of the coke; and the speed of the feeding-rolls is so regulated that they always contain some 50 per cent. excess of coal beyond requirement—that is to say, they really run just twice too fast. A ratchet drive operates the feeding devices—the power being supplied by the electrical plant referred to when dealing with the coke extracting arrangements. The top feeding devices and the bottom discharging drum being mechanically actuated, makes the process completely automatic. Before leaving these features, it may be added that a continuous foul main runs down each side of each setting; and connections with a screw-down valve are made to these from each retort.

Above the retorts are the coal-hoppers, to carry sixteen hours' supply. Shoots from these hoppers direct the coal to the feeding arrangements. The coal is raised to the hoppers by a bucket elevator (with breaker at the foot) situated at one end c each block of settings; and it is distributed to the hoppers by push plate conveyors running between them (there being two hopper to each bed), so there is one conveyor to each block of five settings The plant is all so designed that it will deal with a second serie of ten settings, for which room has been left at the end of th house. These two blocks of retorts—40 in all—have a guarantee minimum carbonizing capacity of 2½ tons of coal per retort pe day, or in the total 100 tons; but the figures from actual workin that have been published from time to time in our columns show that this minimum guarantee is materially exceeded. And i regard to labour, when coke-conveyors are introduced, three mer per eight-hour shift will be sufficient to deal with the installation producing about 1,250,000 cubic feet of gas per day. This surely will bring carbonizing wages down to somewhere about the irre ducible minimum.

There is not a great deal more work to do in connection with the installation, which will in a few weeks be in operation—in fact, before many days are over part of the settings will be under slow fire. Looking at the structure superficially, there is all the evidence about it that it has been carried out with an eye to efficiency, durability, and smooth automatic operation. From an installation on such a scale, we shall look for results that will in every way be confirmatory of those published in respect of the working of smaller installations.

CONCRETE BUILDING ENCLOSING A GASHOLDER.

A reinforced concrete building has recently been constructed for the Municipal Gas-Works at Reick, near Dresden, for the purpose of enclosing a gasholder of 3,884,650 cubic feet capacity.

The structure (according to "Engineering Record") consists of a circular container and an enclosing wall, both of reinforced concrete, and a domed roof and lantern having a steel frame, and rising to a height of 246 feet above the foundation. The container is constructed for a depth of water of 32 ft. 10 in.; and it serves also as the foundation for the enclosing wall. A double layer of asphalted felt was first laid, followed by a reinforced concrete slab, 3 ft. 3 in. thick. At its upper part, the container wall is only 2 feet thick. As the wall was raised, the back was tarred; the inner surface being finished with cement mortar.

The enclosing wall consists of (1) a plinth 24 ft. 11 in. high and 2 ft. 5 in. thick, (2) the main wall, 78 ft. 2 in. high and 8 in. thick, and (3) an upper wing and cornice, 30 ft. 4 in. high. Five horizontal galleries, carried on corbels, aid in stiffening the structure. The cornice is hollow; the top being covered by reinforced concrete slabs. Five towers with internal staircases are added, chiefly for architectural reasons, to break up the surface. They were erected after (and independently of) the wall, and are not rigidly connected with it, as it was feared that such a construction would cause cracking during changes in temperature. The external surfaces were treated so as to give the effect of stone.

The dome consists of a number of steel trusses, each lying in a meridian plane and intersecting at the centre. A stiff steel ring, forming the base of the dome, is built into the cornice; and vertical angle irons are riveted to it, in order to distribute wind stresses over as large an area of wall as possible. The lantern is of steel, filled in with reinforced concrete panels.

When the building was completed, a slab was constructed to serve as a floor within the ring by first placing a layer of concrete 12 inches thick in 23 feet squares, and then covering these squares with a layer of concrete $1\frac{9}{16}$ inches thick, reinforced with rods. Over the whole surface, a water-tight lining was laid.

Gas-Engine Silencers and Explosions.—It is remarked by the "Engineer" that the possibility of gas-engine silencers causing an explosion probably does not suggest itself to owners of gas-engines; but the risk is one that cannot be ignored, and several failures of this kind have been experienced. Such a failure in connection with a 1000 H.P. gas-engine, recorded in the annual report of the Inspector of Factories, which led to fatal consequences, may be noted by those interested as a warning of the possibilities that exist in this direction. It should be remembered that unconsumed gas may at any time be discharged into the silencer through misfires, and that the hot gases of the next discharge may ignite them, causing an explosion which the outlet-pipe cannot release in time to prevent dangerous pressure. It would thus seem that safety lies only in making the silencer strong enough to stand the explosion, or in providing relief-valves which will act quickly enough to prevent accident.

A NEW HOLDER AT ARBROATH.

Inauguration Ceremony.

As has been mentioned in the "JOURNAL" from time to time, considerable reconstruction and extension of the Arbroath Corporation Gas-Works has been effected in recent years. The latest accomplished work has been the erection of a new gasholder, the inauguration of which took place last Thursday—the ceremony being also held to be a celebration of the successful completion of the other works. The gasholder, which is in a steel tank entirely above ground, was erected by Messrs. R. Dempster and Sons, Limited, of Elland; the concrete foundation and connections having been put in by the Corporation workmen, under the direction of Mr. A. C. Young, the Gas Manager. The tank is 101 ft. 6 in. in diameter, and 26 ft. 6 in. deep. There are two lifts to the holder—the outer, 100 feet diameter and 26 feet deep; and the inner, 97 ft. 6 in. diameter and 26 feet deep. The capacity of the holder is 400,000 cubic feet. The storage of the works has hitherto been only 300,000 cubic feet, provided by two holders—one of 200,000, and the other of 100,000 cubic feet. The new holder therefore raises the storage to 700,000 cubic feet. There is no need to describe the other alterations which have been effected, as they are sufficiently referred to in the remarks by Provost Alexander and Mr. Young.

For the inauguration ceremony, the members of the Town Council, and neighbouring gas managers, accompanied by their lady friends, assembled at the works.

Provost ALEXANDER, opening the proceedings, said that when first electricity came to be a thing which was adopted for lighting, owners of gas-works got a little alarmed. They thought that if this new illuminant continued to gain the approval of the inhabitants of the country, their occupation, as producers of gas, would be gone. But he was glad to say that, like many another thing in this world, electricity had been a blessing in disguise, because gas engineers and managers recognized their responsibilities. They were a body of highly trained and competent men. They set their wits to work; and they had succeeded in introducing new methods of producing gas, which had been entirely successful—the gas being made at very much less cost. In addition, the methods in which gas was now used as an illuminant, put it, he was going to say, on an equal platform with electricity; but he would now say that it left electricity far behind. Of course, gas and electricity each had a field in which it could be used economically. Electricity, so far as he could make out, was very suitable for power. Gas, on the other hand, even though the bulk of the householders in Arbroath were to introduce electricity, would still have a large field of use for heating, cooking, and other things. When some of the electric companies applied for a Provisional Order for Arbroath, the Gas Commissioners, like others, were somewhat alarmed; and they did all in their power to stave off the evil day. Of course, they could not do this. They now had an up-to-date Company, who started supplying electricity, both for power and light, last year. He was told that the Company were highly satisfied with the result of their first year's working. Speaking as a Gas Commissioner, he might say they were very highly pleased with their last year's working. Every year, for a number of years back, they had had large increases; and though last year the increase was not, perhaps, quite up to the average of previous years, still, if they took into consideration that they had to meet a new competitor, and the state of trade, he thought the Town Council and their Manager had reason to congratulate themselves. Since Mr. Young took charge of the works, the whole manufacturing plant had been renewed, at a very large cost; and when he told them that all this expenditure had been incurred without adding a penny to the capital account, it said a very great deal for Mr. Young and his able Convener, Bailie Smith. For two or three years Mr. Young had been pressing on the Commissioners the necessity for providing more holder accommodation. They, seeing that they had spent a large amount of money, wished to postpone the work as long as they possibly could; but at the end of last year Mr. Young decidedly gave them warning that, if anything occurred during the coming winter, he would not be held responsible. They knew Mr. Young was a safe guide; and they took his advice. They appointed a Sub-Committee to visit certain towns; and after a good deal of information had been obtained in this way, the Sub-Committee strongly recommended the Town Council, in building their new holder, to adopt the type they had. Mr. Young, of course, had been the Engineer of it. The holder had been built to his design in every detail; and he might say, in passing, that the reconstruction of the works, from the retorts upwards, had all been carried out to plans by Mr. Young, and under his supervision, and that a good deal of the work had been erected by his men directly. They were met for the purpose of inaugurating the holder; and it had been thought that the right thing to do was to ask the wife of the Convener to perform the ceremony. He had great pleasure in asking Mrs. Smith to turn the wheel which would open the valve and allow the gas to pass from the holder into the town main.

This was done by Mrs. Smith, under the guidance of Mr. Young.

Provost ALEXANDER then said Mr. Young had informed him that he was thoroughly satisfied with the work the Contractors had turned out. As their representative, Mr. King, was present, he would ask him to say a few words.

Mr. E. J. KING said this was a red-letter day in the annals of the Corporation Gas-Works. When he told them that it was twenty-five years since the last gasholder inauguration took place there, they would agree with him that it was a rather important day. Bailie Smith, the Convener, had actively interested himself in the holder, as he had in the work of the gas-works during the past three years; and they, as Contractors, thought that this was a fitting opportunity to present Mrs. Smith with a little memento of the occasion. [The presentation took the form of a silver rose bowl, with ebony stand.]

Bailie SMITH, on behalf of his wife, returned thanks for the gift.

The company were then photographed, and opportunity was taken to inspect the new holder; a goodly number of the visitors ascending to the gangway round the top of the tank. Thereafter luncheon was served to about a hundred ladies and gentlemen in a tent on the ground—Provost Alexander presiding. The Chairman intimated that they had apologies for absence from Mr. W. Doig Gibb, the Chief Engineer to the Newcastle and Gateshead Gas Company, who had only recently obtained what was considered the blue ribbon of the gas industry, by being appointed Engineer of the South Metropolitan Gas Company, of London; Mr. Thomas Wilson, of Coatbridge; Mr. Alex. Waddell, of Dunfermline; Mr. S. Milne, of Aberdeen; and others.

Mr. A. YUILL, of Dundee, proposed the toast of "The Town and Trade of Arbroath," which was responded to by Ex-Provost GRANT.

Mr. W. B. M'LUSKY, of Perth, proposed "The Arbroath Gas-Works," and in doing so said that the progress of the Arbroath gas undertaking might be said to date from 1902. At that time, owing to very heavy capital charges, gas was sold at a high price. They then sold 66 million cubic feet a year; now they sold 99 millions. At that time they paid 1s. 2d. per 1000 cubic feet for interest, sinking fund, and annuities, and they had a gross fixed charge of 19s. 5d. per 1000 cubic feet of gas sold; now, through the most excellent management of Mr. Young, they had been able to reduce this fixed charge to 13s. 7d. The consequence was that, notwithstanding many important extensions and improvements in the works, they were able to sell gas at 2s. 8½d. per 1000 feet, as compared with 4s. 4½d. in 1902. It would not be possible to carry on works of such magnitude with so much success without administrative ability of a very high grade. They had, at the table, examples of the type of men whom the people of Arbroath had chosen to manage this revenue-producing department. It was not every town which was so circumstanced. He considered that Mr. Young had been particularly fortunate in his Council, and that the ratepayers had responded, to a most exemplary degree, to the efforts which the Corporation had made to serve them with gas at a low price. During the last seven years, consumers in Arbroath had increased by 500, and the number of gas-cookers had increased from 800 to over 4000. These figures were phenomenal. They had nothing to compare with them—if, for the moment, they forgot Dundee. It was a very big effort to get 3200 ratepayers of Arbroath to come over to gas cooking in such a short period. In looking over the Corporation gas accounts, he had been very much impressed with their courageous policy in the finance department. Every liability, every obligation, had been met, and no burdens had been carried forward to posterity. They had expended £11,400 out of revenue, in reconstructing the works; and in the conception and execution of all these works, Mr. Young had shown that he was an Engineer of no ordinary standard.

Bailie SMITH, in acknowledgment, said it had taken a great deal of trouble, of anxiety, and of skill, to bring the gas-works to what they were. He could not tell them when gas-works were first erected in Arbroath; but they had reports of the Gas Company as far back as 1825. When Mr. Young last year complained to them in respect of the inefficiency of storage, it was not the first report on the subject which had been given to the gas authorities; for in 1863 the Manager reported that they had a storage capacity of 82,000 cubic feet, with an average nightly output, after Martinmas, of from 120,000 to 130,000 cubic feet, and on the last two nights of the year, 150,000 cubic feet. On these two occasions they had only storage for half-a-night's supply. The last erected gasholder was then built. The smaller holder was built in the years 1850-51. In 1832, the annual consumption of gas in Arbroath was 250,000 cubic feet; in 1842, it was 5,207,000 feet; in 1852, 10,594,000 feet; in 1864-65, 26,420,000 feet; in 1874-75, 33,873,000 feet; in 1884, 41,825,000 feet; in 1892, 46,306,000 feet; in 1902, 77,397,000 feet; and in the past year, 97,665,000 feet. The last five years, the consumption of gas had increased by over 20 million cubic feet per annum. In 1852, the prices of gas, taken from the books in the office in Arbroath, were: In Arbroath, 5s. 10d.; in Aberdeen, 6s. 6d.; in Brechin, 5s. 10d.; in Cupar, 7s. 6d.; in Dundee, 5s. 6d.; in Dunfermline, 6s. 3d.; in Forfar, 8s. 4d.; in Kirkcaldy, 5s. 10d.; in Montrose, 5s. 10d.; in Perth, 7s.; and in St. Andrews, 7s. 6d. He expected that in these places they were as proud to be able to supply comparatively cheap gas to-day as they in Arbroath were. One other point which he wished to touch upon was the valuation of the gas-works. In 1856, the works were assessed at £572. In 1860, the amount paid in rates and taxes was £109; last year they paid £819. The Assessor this year proposed increasing the valuation by about £500, which would mean that they would have to pay over £900 in rates and taxes next year. This was being charged upon them on account of their present system of financing. It was a system which he did not think was altogether fair for the works. On the one hand, they had people who were talking about being thrifty and paying everything in ready cash; but whenever they started to pay ready cash, up went the valuation, because it was said that the money they paid for various articles of plant was really profit, and must be taxed. They, however, did not mind this so much, because the additional taxation on the gas-works would mean considerable relief to the ratepayers. They were also getting cheaper gas, which meant a double advantage to the community through the gas-works being successful. When the works were taken over, there was £20,000 worth of stock, upon which they had been paying practically £1400 yearly as interest. They had paid, as interest, £50,000; and they had not redeemed £2000 of the stock. They had to put the cost of the new holder and condensers to the suspense account, which would bring it up to some £6000 or £7000; but they wanted to have this paid off in three years' time. Some people might say that they were treating the present consumers very unfairly. He did not think they had anything to complain of, seeing that they were having gas supplied so cheaply; and he did not think posterity would feel they had been heaping burdens upon them. Posterity would have to thank them a great deal more than they had to thank their predecessors.

Ex-Bailie DUNCAN proposed "The Engineer and Contractors."

Mr. YOUNG, speaking of the new plant which had been laid down during the 7½ years of his management, said that the new holder was only a very small part. He should say it would cost only about a fourth of the sum which had been spent altogether in the gas-works. First of all, they erected a complete retort-bench, consisting of 80 retorts, in

ten ovens, back to back, eight retorts in each oven, with all the iron-work, hydraulic main, foul main, dip pipes, off-take valves, and the other appointments of a retort-bench. The bench was fired on a full regenerative system, with an all-round subway. The bench was capable of something like 25 per cent. more work than they at present required it to do, at the maximum output. The foul main had been carried round the retort-house, for the cooling of the gas gradually, with the consequent preservation of the rich hydrocarbons, which otherwise would be lost. Two 8-inch retort-house governors, of Messrs. Parkinson and W. & B. Cowan's make, had been fixed on the foul main. By means of them they were able to work with a much less seal, with the consequent result of a greater yield of gas, and a reduction of other evils, and with entire safety from the risk of over-pulling by the exhausters. Part of the retort-house roof fell in upon the bench one summer morning, and this had to be replaced. The new roof was entirely of steel, and in one span; so that they now avoided the pillars which were used formerly to support the roof, and which obstructed the men in their work. The walls of the retort-house were raised considerably—making a cooler and airier house. The retort-bench and the house were designed to enable them to introduce stoking machinery, should this be found desirable. The exhausting plant was of a very antiquated type, and had been replaced by new exhausters of Waller's four-blade design. Each exhauster was now complete, with its own engine on its own bed-plate, and was capable of the entire work required of it, without the assistance of the other. Immediately after the exhausters they had connected a Livesey tar-extractor, made by Balfour and Co., and a set of Holmes's rotary brush scrubbers, by means of which the extraction of all the ammonia was achieved, and also a large proportion of the impurities which formerly travelled on to the purifiers and made purification costly. The old pumping machinery was worn out—costing, in a year, very nearly as much to repair as new ones could have been bought for. These had been thrown out, and new ones put in, to deal with tar, ammonia, and water; and an additional tank had been built to assist in the separation of the tar from the ammoniacal liquor. A Maxim carburettor had been installed and used since 1903. The old station meter was over forty years of age. It was too small, and threatened to collapse. This had been replaced by a new meter of greater capacity; and the house in which was the old one had been utilized for the holding of a coal-testing plant, consisting of an iron retort, fired by gas, with water-tube condensers, a scrubber, a purifier, and a 100 cubic feet and a 5 cubic feet gasholders. A new 20-inch station governor, made by Messrs. Peebles and Co., Limited, had been connected between the gasholder and the town. The old governor was of a very old type, and required a variation of from 2-10ths to 3-10ths to bring it into automatic action. The steam-boiler, used for sulphate manufacture, steaming the furnaces, and for other general uses about the gas-works, was much too small. A new and larger boiler had been put down and coupled up; so that they now had two boilers, giving them a stand-by. A new sulphate plant, capable of producing over 30 cwt. of sulphate, had been installed. This consisted of a still and superheater of Gillespie's patent, liming apparatus, condensers, and an enlargement of the oxide purifier for treating the waste gases. All the connecting pipes and the bye-pass arrangements for the various parts of the plant, including the new holder, had been procured from the founders and fitted up by their own employees. With the exception of the retorts, the plant was equal to a daily make of a million cubic feet of gas, which was twice the quantity required at the present time. The distributing mains in the town had been enlarged in many of the streets, and an extra 12-inch main had been laid from near the gas-works to well beyond the centre of the distributing area. No money had been spent unnecessarily upon buildings. All the plant which had been put down had been the very best obtainable; and in no case could they say that the results had not been all that was expected. They had purchased twelve railway waggons, by which they effected a considerable saving in railway carriages. A set of water-cooled condensers, capable of dealing with a million cubic feet of gas per day, had been erected this year. The Corporation's property had been increased in value by £4500 worth of gas-stoves, and by £1500 worth of coin-meters. The new holder was on the spiral-guided system, which enabled them to do away with costly columns and girders; and it had been erected for something like £1200 less in consequence. The thinnest plates on the top lift of the holder were No. 11 B.W.G., and on the lower lift No. 12 B.W.G. The storage capacity was now 700,000 cubic feet; and the maximum output for one day was 520,000 feet. The new holder, he was thankful to say, had been erected without accident to life or limb, and without a hitch. They had tested the holder; and in his opinion it was perfect. With the upper lift the holder displaced 4 inches of water, and with the lower lift 6¼ inches. The two lifts weighed 120 tons.

Mr. King also responded. He said they had been constructing these holders for the last twenty years, so that the style was no experiment. Since they began, there had been erected 300 of these holders in this country and abroad. They had just completed a very large one in Buenos Ayres. If they could work holders of this description where typhoons and monsoons were to be met with, surely they need have no hesitation or fear in using one in Arbroath. The holder looked, to all intents and purposes, as though it had no means of support; but he could assure them that it had, and that it was well and scientifically guided. In Scotland, they had been rather slow in adopting the new holder, but at the present time there were about twenty erected there, which showed that they were waking up to the advantages, in cost and otherwise, of these holders. He ought not to conclude without congratulating the Corporation on having such an able Engineer as Mr. Young. He had turned their gas-works inside out, to the great advantage of the people of Arbroath.

A number of other toasts were honoured.

The Directors of the Dowlais Gas and Coke Company, Limited, have filled the vacancy caused in the management by the death of Mr. David Jones by the appointment of Mr. J. H. Jones, a son of the deceased, who has been in the service of the Company for over four years, and for the past fourteen months has satisfactorily discharged the duties of Deputy-Manager.

GAS-WORKS AT LEVIN (N.Z.).

Opening Ceremony.

The Municipality at Levin, which is a progressive town in the Manawatu district of New Zealand, have recently been engaged in the erection of gas-works, the official opening of which took place towards the end of July. The ceremony of turning on the gas was performed by the Mayoress, Mrs. B. R. Gardener, who was presented by Mr. J. W. Blackman (Manager of the Masterton Gas-Works), the Engineer who had superintended the construction of the works, on behalf of the Gas Committee of the Levin Borough Council, with a gold brooch in the form of the wheel of a gas-valve, as a memento of the occasion. Mr. Blackman, on his own behalf, also presented the Mayoress with a silver card-case suitably inscribed. Thereafter, at the invitation of the Mayor, the company adjourned to tea.

The Mayor, in thanking the visitors for their attendance, said that a sum of £10,000 was borrowed; but the Council had sufficient faith in the prosperity of the borough to make full provision for the requirements of years to come. For this reason, up-to-date works and buildings had been erected. He did not think the works would be required to produce up to their full capacity for the next five years. Probably no small gas-works to serve a population of the same dimensions as that of Levin had started with better prospects. Some 7 miles of cast-iron mains had been laid, and 3 miles of wrought-iron mains. Levin had only some 18 miles of streets; and the total area was 1½ square miles. The pipes tapped almost every house in the borough. The undertaking would start with over 100 householders using gas; and in addition there would be 40 street-lamps. He could say with all confidence that one month from date there would be 175 gas consumers in the borough. In regard to the plant, there was only one bench being worked out of three installed. The Engineer had been given a free hand in regard to the installation. He was told to spend the £10,000 to the very best advantage; and no cleaner work had been carried out in any place in New Zealand. Altogether about £9000 had been spent. Of this, £3800 represented English contracts; for materials purchased locally and throughout New Zealand, £3000 had been paid away; and about £1300 had been spent in wages. In addition to the £9000, a large sum had been spent on lamps and gas-fittings, the Council having decided to push this part of the business.

Mr. Blackman, in response to the toast of his health, remarked that he had designed the works so that very little additional expenditure would be required for many years. At present only three retorts would be used; but as Levin increased in size and the public came to appreciate the benefits of coal gas, the five retorts in each of the three arches could be utilized, so that a maximum of fifteen retorts could be brought into work, producing 75,000 cubic feet of gas daily. Messrs. Whittaker and Williams, the Contractors, had carried out their work well; and the Manager (Mr. C. Shaw) had put the plant down excellently.

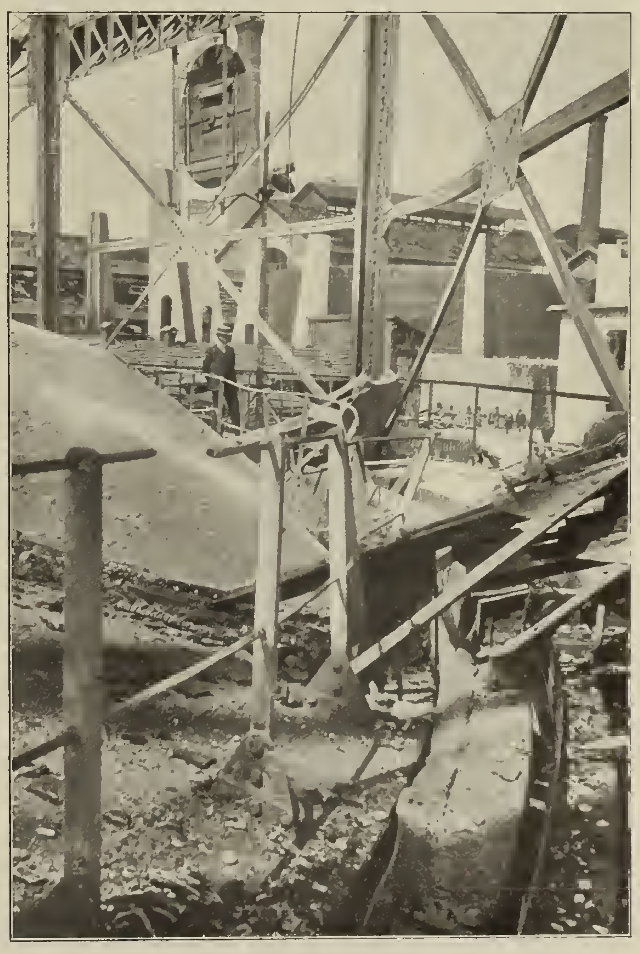
The plant, as already mentioned, consists of three settings of five 21-inch by 15-inch ◻ retorts. They are on the regenerative system, by Messrs. Gibbons Bros., who also supplied the iron-work, hydraulic main, self-sealing mouthpieces, and fire-clay material. The holder is 40 feet by 16 feet deep, in steel tank. There is a tower scrubber, with washer at bottom, and also pipe condensers. The two purifiers are 8 feet square by 4 feet deep, on Green's patent, fitted with Milbourne's valves. All this portion of the plant was supplied by Messrs. C. & W. Walker. The gas-engine and exhauster are by the Bryan Donkin Company, the station-meter by Messrs. James Milne and Son, and the station-governor by Messrs. Peebles and Co. The meters are all dry, and have been supplied by Messrs. Alder and Mackay.

In addition to filling the post of Manager of the Workington Corporation Gas-Works by appointing Mr. E. G. Hutchinson, as recorded last week, the Council have agreed to a recommendation of the Gas Committee that Mr. John R. Boadle, of Workington, who served his articles under the late Manager (Mr. George Keyte) be appointed Assistant Manager, at a salary of £104, to rise by yearly increments of £10 for three years.

An interesting presentation took place at the Ilford Gas-Works last Friday. The Assistant Manager, Mr. Thomas S. Canning, was married at Newport (Mon.) on Wednesday last; and as he has during his two years' occupancy of his position as Assistant Manager succeeded in getting himself immensely popular with the staff and employees, it was decided to make him a presentation on this auspicious occasion. The presentation, which was made by Mr. W. B. Farquhar, the Engineer and Manager of the Company, took the form of a handsome pair of bronze statuettes, representing the Sower and Reaper. There was a large gathering present at the ceremony; and on handing the present to Mr. Canning, Mr. Farquhar referred to the immense popularity Mr. Canning enjoyed, and hoped the presentation would always remind him of the esteem and respect in which he was held by all with whom he had come in contact at the works. Mr. Canning replied in suitable terms, and said he was deeply affected at the way in which his colleagues had shown their appreciation of him. The presentation would long remain with him as a memento of a very happy occasion.

THE RECENT EXPLOSION AT THE GENEVA GAS-WORKS.


Two Views of the Wreck of the Purifier and Station-Meter Houses.

The Gasholder and its Framing after the Explosion.

Ve have received from an esteemed correspondent a series of hotographs—taken by M. Louis Tritten—showing some of the ffects of the recent lamentable explosion at the Geneva Gas-Vorks, and so are enabled to supplement the particulars given ı the "Journal" for Aug. 31 as to this disastrous affair.

Last Friday afternoon, M. Albert Gampert, the Administrative dviser in charge of the Industrial Service of Geneva, issued a otice, which was posted on the walls throughout the town, to the fect that consumers could again use gas with the exception of ıose living in certain of the outside districts; and in these latter would be available in two or three days. Consumers were reinded that they must strictly conform to the following regulaons: "(1). For the purpose of clearing the pipes of air, open the ıeter, then turn on one of the heating or lighting burners—for preference that which is furthest away from the meter, and this in a room where the window has been left open. (2). Wait till the gas has reached the burner after having driven out the air which is in the pipes. This can be easily found out by the smell. Then apply a light and wait a few moments to see that it does not go out. If the gas does not pass through the pipe, or if it goes out, be careful to close the meter again and all the cocks, and advise the Gas Department. If these precautions are strictly observed, there will be no explosion nor any danger to fear. If these instructions are not properly carried out, the City of Geneva will not be responsible."

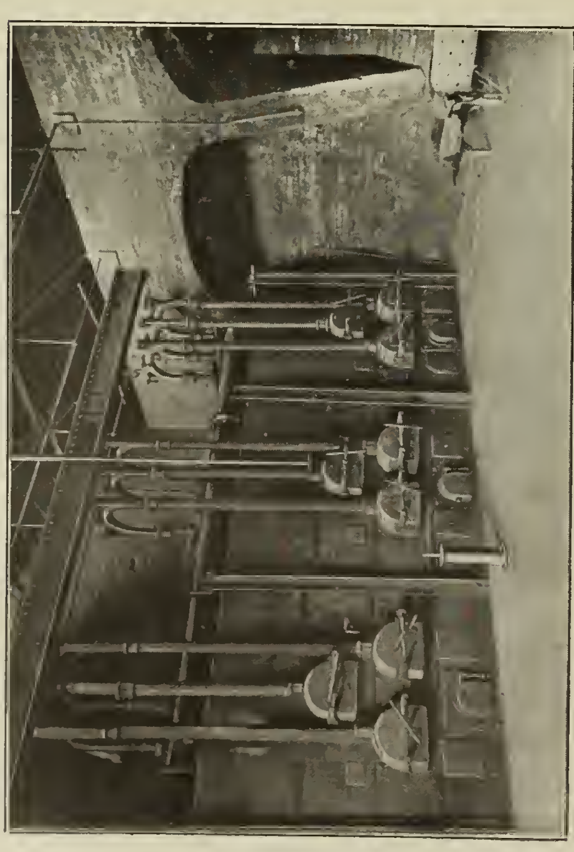
Thorium Nitrate.—We understand a change in the situation has taken place in America in regard to thorium; the duty having been advanced from 25 to 40 per cent.

The Purifying and Condensing Plant.

MURDOCH'S GAS PLANT AT SOHO.

We are indebted to the "Engineer" for the reproduction of the accompanying two blocks of Murdoch's gas plant at Soho, which appear in their current issue among a number of interesting photographs of old tools at these Birmingham works. The photographs were taken before the works were acquired by Messrs. W. & T. Avery, Limited.

With regard to the gas manufacturing apparatus, our contemporary says this plant was used until the old works changed hands; and in Murdoch's own time it had lighted the underground shops or caverns in which he did much of his mechanical work.



Interior of the Retort-House.

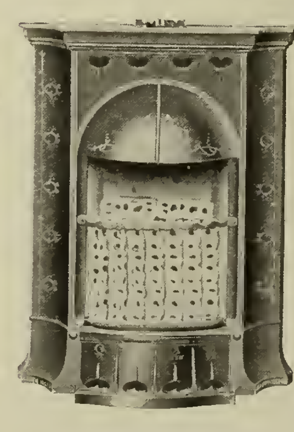
ARDEN HILL AND CO.'S NEW FIRES.

Again Messrs. Arden Hill and Co. are well in evidence wit their new apparatus for the gas-fire season. Heading their li of novelties is the "Versailles"—a new gas-fire of quite distin class, the striking feature of which, apart from its very fine desig is the embodying of the makers' new ideas as to greatly enlargin the width of the fire space. This new departure enables an ordinary coal-fire to be replaced by a gas-fire having the sam extent of radiating surface, and so removes one more obstacle t the great popularity of the newer apparatus. The "Versailles, which is made in two sizes, 17-inch and 21-inch respectively, pr vides an amount of firewidth far in advance of anything hithert attempted in this direction, yet it is claimed that, by its includin the "Simplex" shallow-fire principle and the patent "Thermo firefront, it consumes no more gas than the best ordinary stove The fire is chaste and artistic in design; and the makers belie that it will achieve a high degree of popularity among gas cons mers as well as among gas authorities.

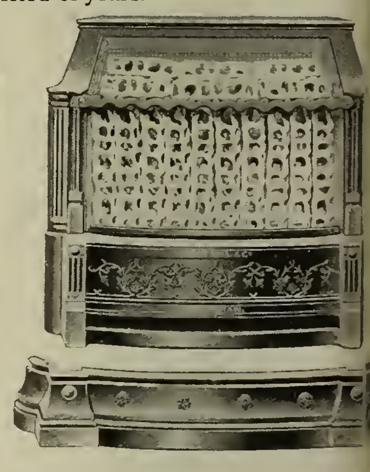
The "Versailles" Gas-Fire.

The "Thorium" Gas-Fire.

The winter season of 1907-8 was marked by the introduction o Messrs. Arden Hill and Co.'s "Radium" stove—a "Slot" gas-fir which quickly earned a high reputation for itself as being an ide fire for hiring-out purposes. This fine effort in stove design ha been followed up this season by the introduction of two othe similar fires—one, with square top, named the "Thorium," whic is made in three sizes, with firewidths of $8\frac{1}{2}$, 10, and 14 inche respectively, the other—a nursery fire—is named the "Cerium. The latter is made in two sizes, 10-inch and 14-inch. It is liste at quite a moderate figure, and is thoroughly up-to-date in ever detail. Thus a series of three excellent slot gas-fires is provide wherein all the removable parts are common to the three fire and therefore interchangeable, as has been the case with a num ber of the firm's fires for a period of years.



The "Cerium" Gas Fire.



The Patent "Adept" Basket Fire—Sho adjustable fender partially remove

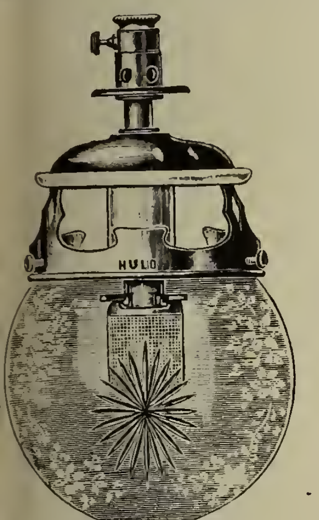
Another novelty which cannot fail to be of interest is th "Adept." This is a new basket fire (for which a patent has bee applied for), which, taking as its point of departure the old fashioned "basket" fire, is intended to compete with the mos modern fires hitherto introduced. It is fitted with the "Thermo' patent and the "Simplex" shallow-fire arrangement; and a specia feature, of no small importance, is a patent adjustable grate-fron which may be had with the stove. This can be raised or lowered to hide the ash-pan opening of the coal-grate. When raised, it is held in place by two screw knobs. Messrs. Arden Hill's fires are being fitted this season with the (1909) patent form of "Simplex" gas and air adjuster (as described and illustrated last week, p. 630), whereby a perfectly graduated adjustment between minimum and maximum limits is provided without the employment of screw threads and consequent leakage. The new "Simplex" secures equally unimpeded pressure at all points.

The firm have also introduced a new invention for preheating the gas before it enters the burner, by which the radiant heat is thus greatly increased. This contrivance can be fitted to the "Versailles" fire at a small extra cost.

SOME MORE UP-TO-DATE LAMPS.

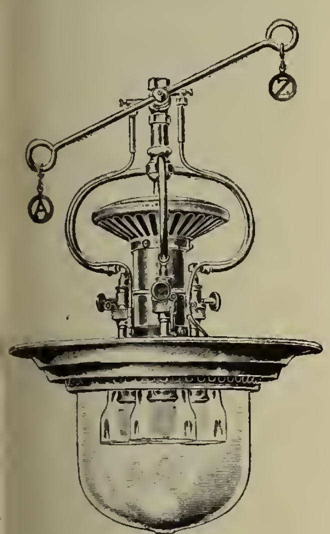
'ATTERNS of up-to-date inverted incandescent gas-lamps for the ›rthcoming lighting season are now being introduced in numbers /hich demonstrate the continued, and increasing, well-deserved ›opularity of this form of lighting.

In their newly-issued catalogue (which is full of very attractive .esigns of inverted gas-fittings), Messrs. D. Hulett and Co., of ʼo. 55, High Holborn, give "pride of place" to their improved Hulo" burner, which is their leading line in inverted burners, nd for which they are experiencing a very large demand. It is ıf heavy quality, well finished, and neat in appearance; and it is ıow fitted with a china tube over the gas-way, which, with the :hina top, prevents the deterioration of the metal parts, besides ›eing of assistance in the matter of reflection of the light. A new pattern insulated regulator has also been introduced, so that the burner can be easily governed to suit all varying pressures and qualities of gas. The dome-shaped top prevents contamination of the inlet-air by the products of combustion.

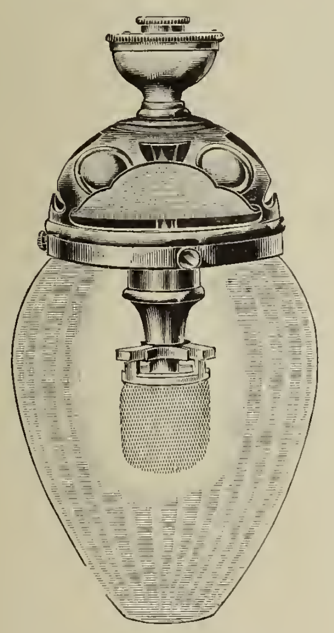


The "Hulo" Burner.

Two of the leading lines for this season of Messrs. J. & W. B. Smith, of No. 17, Farringdon Road, E.C., are the "Imperial" inverted indoor lamp and their improved "Veribest" gas-burner. The "Imperial" is a powerful regenerative lamp, which is claimed to have a lighting capacity of about 125-candle power per burner; the consumption being in the neighbourhood of 4 cubic feet of gas per hour. It is listed for two, three, or four lights; and the burners have gas and air adjusters to them. Another point in its favour is the easy access that can be had to all parts of the lamp, which has a handsome appearance, in white enamel, relieved with gold lines. As to the already well-known "Veribest" gas-burner, this has been brought up to date by the addition of a new white enamelled heat disperser, for the prevention of discoloration of the fittings. The burner is provided with a special mixing-chamber for the proper admixture of the air and gas; and there is an air-regulating shutter at top. All parts of the burner—which is neat and well finished—are easily renewable.



The "Imperial" Regenerative Inverted Indoor Lamp.



The "Veribest" Inverted Incandescent Gas-Burner.

According to the "Ironmonger," an unusually active business is now being done in Germany in illuminants of various kinds, and especially in incandescent gas-mantles, though it is feared that exceptional slackness will succeed the present rush when the new taxes come into force. The new tax on incandescent goods does not apply to stocks in the hands of the trade when the new taxation comes into force on Oct. 1; but a general misapprehension of the meaning of the clause is probably the explanation of the present rush of buyers. The Association of Incandescent Gas-Mantle Manufacturers (which comprises all German producers of importance) announce an advance in prices. For the most part, however, manufacturers do not derive much benefit from the new quotations, as practically all their present output was contracted for at rates formerly ruling.

AMSTERDAM MUNICIPAL GAS-WORKS.

Report for 1908—Past Ten Years' Working.

It was ten years on Aug. 10, 1908, since the Municipality of Amsterdam took the gas-works over from the Imperial Continental Gas Association; and some figures from the annual report for 1908 may be given to show the progress made during this period. For these, we are indebted to Heer J. Van Rossum du Chattel, the Manager of the Works.

On Aug. 10, 1898, the work began with some 800 officials and workmen; while ten years later this number had increased to 2072—the number of workmen being 1933 at the end of December, 1908. During the first year of working (Aug. 10, 1898, to Aug. 10, 1899), £52,600 was paid out in salaries and wages. From Aug. 10, 1907, to Aug. 10, 1908, it was £139,305. The total amount of salaries and wages paid over the past ten years was £1,024,468.

From Jan. 1 to Aug. 10, 1898 (the last months during which the Imperial Continental Gas Association delivered gas), the consumption was 600,575,594 cubic feet; whereas during the same period in 1908 it was 1,637,277,576 cubic feet. The total consumption was: In 1898, 1,104,664,506 cubic feet; and in 1908, 2,919,056,773 cubic feet.

	Gas-Meters.	Ordinary.	Prepayment.
On Aug. 10, 1898 there were	25,500	24,594	916
" 1908 "	95,934	44,087	51,847

In the past ten years there was paid:—

Interest on capital	£449,903
Amortization	405,435
Contribution to the Municipality	692,613
Extra-reserve	91,666
Written off (depreciation)	558,145
The works, &c., were bought for	1,433,872
Erections and extension, including the unfinished third gas-works so far as the half year of 1908	818,322

After writing off £558,144, the total value (in the books) of the buildings, yards, mains for all the works, &c., was, after ten years, £1,694,050. During these ten years there were produced 20,307,045,000 cubic feet of gas, for the make of which there were used about 1,781,413 tons of coal and coke.

In 1908, there were supplied to the gas-works by railway and boat (excluding the supply in carts, &c.):—

	Waggons.	Boats.	Tons.
Coal	16,364	—	221,255
Sulphuric acid	151	—	1,564
Benzene	188	—	1,923
Solar-oil	301	—	2,746
Lime	30	—	307
Chemicals	6	22	188
Retorts, fire-clay, &c.	166	—	1,751
Ironwork, &c.	76	—	720
Sand, mortar, lime, &c.	59	6	1,051
Oxide of iron for purifying	—	10	1,313
Total	17,341	38	232,818

The retort-house at the Eastern Gas-Works contains 80 furnaces of nine retorts each, provided with Arrol-Foulis machinery. At the Western Gas-Works, there are two retort-houses of 40 furnaces with nine retorts each. Eight of the furnaces are provided with De Brouwer through retorts. The gas-works contain 1440 retorts in all, of which a maximum of 1016 were used at a time. The maximum of fire-days of one furnace has been 1584. There were loaded a total of 1,403,263 retorts, with an average weight of 324 lbs. 5 oz. The average weight of coal distilled per retort per diem was 1684 lbs. 5 oz.

The average production of coal gas per retort and per diem amounted to 7910 cubic feet.

For the distillation of gas there were used:—

German coal	141,563 tons	= 69·68 per cent.
English coal	61,611 "	= 30·32 "
Australian cannel	4 "	
Total	203,178 tons	
For engines and workshops	236 "	
Total use of coal	203,414 tons	

For enriching, there were employed 1909 tons of benzene and 3137 tons of solar-oil.

The production of gas, including that resulting from the benzene, per ton of coal was 10,518 cubic feet.

The total production of mixed gas was—

	Cubic Feet.		Cubic Feet.
1899	1,223,661,918	1904	2,198,060,332
1900	1,413,128,060	1905	2,356,524,150
1901	1,628,532,480	1906	2,604,312,126
1902	1,825,902,124	1907	2,819,807,309
1903	2,056,137,396	1908	2,918,523,210

The maximum daily production, on Dec. 23, was 11,264,583 cubic feet, or 0·385 per cent. of the yearly amount. The minimum daily production, on June 8, was 4,940,792 cubic feet, or 0·164 per cent. of the yearly production. With the coal gas was mixed 781,441,226 cubic feet of water gas, or 26·86 per cent. of the total gas production. So the production of coal gas only amounted to 2,137,081,984 cubic feet.

The consumption of gas for 1908 was divided as follows:—

	Cubic Feet.
Private persons through ordinary meters	1,690,065,334
,, ,, ,, prepayment meters	952,854,582
Municipal buildings	50,576,055
Public lighting	123,958,829
Special contracts for illumination, &c.	1,362,373
Water gas and sulphate and cyanide plants	3,059,371
Used in the works and loss (3·329 per cent.)	97,180,229
Total consumption	2,919,056,773

The maximum delivery of gas per diem, on Dec. 24, was 12,385,532 cubic feet, or 0·424 per cent. of the delivery of the whole year. The minimum day was May 31, with 4,406,452 cubic feet, or 0·151 per cent.

The capacity of the gasholders is—

	Cubic Feet.
Three two-lift holders	2,330,896
One four-lift holder	3,531,660
Three three-lift holders	4,528,294
Total	10,390,850

or 83·89 per cent. of the highest delivery per diem.

For water gas there are two relief holders of 70,633 cubic feet each.

The following are the figures with regard to coke:—

	Tons.
The production of coke, including breeze, was	145,648
The stock on Jan. 1, 1908, was	3,160
Total	148,808

The coke was used thus—

	Tons.
Steam-boilers	1,950
Furnaces (heating and drying)	33,438
Water-gas production	13,461
Boilers (water-gas plant)	5
Heating gasholder-tanks, mainlaying, &c.	610
Sold	56,051
Small coke and breeze	40,160
Total	145,675
Stock on Dec. 31, 1908	3,133
Total	148,808

For the furnaces there were used 369 lbs. of coke per ton of coal. The production of coke per ton of coal was 1606 lbs., breeze included.

Of the breeze, there was used—

	Tons.
Steam-boilers (gas-works)	18,995
Steam-boilers (water-gas plants)	5,274
Heating gasholder-tanks, buildings, &c., and asphalting	689
Sulphate and cyanide plants	3,360
Sold as small coke and breeze	12,249
Total	40,567

Of tar, there was produced 19,553,136 lbs., or about 96 lbs. per ton of coal. At the Eastern Gas-Works, 2,914,164 lbs. of water-gas tar was produced.

Some 3,649,400 lbs. of sulphate of ammonia was made, or 18 lbs. per ton of coal—a low figure, due to various circumstances. The returns will be much higher in 1909.

Yellow prussiate of potash was only produced at the Western Works. The production was 128,866 lbs. This was less than usual; the works having been stopped for some months.

At the Western Works, 94 purifiers were cleaned, against 126 in 1907. This reduction is due to the use of "Lux Massa." At the Eastern Works, 53 purifiers were cleaned, 24 of which were for the water-gas plant. About 1708 tons of spent oxide were sold.

The length of the mains at Dec. 31, 1908, was 1,293,582 feet.

Diameter in Inches.	Length in Feet.
47	273
36	38,271
32	1,646
30	43,892
22	1,507
18	477
16 to 4	1,207,516
Total	1,293,582

In 1908, 9389 ordinary meters were fixed and 8890 removed; while 64,467 complaints, 38,655 of which were from prepayment consumers, were treated. For prepayment meters, 7745 new installations were made, of which 5140 were for new consumers. On Dec. 31, 1908, 17,571 wet meters and 27,137 dry meters were in use—44,708 in all, with 399,970 lights. There were 54,192 prepayment meters. The average consumption of gas through prepayment meters was 17,588 cubic feet per annum. The largest one stated was 101,712 cubic feet. For this prepayment, 80,941,080 halfpennies were used.

For the public lighting, there are used 9089 burners, burning all night, except some of the group-burners, which are partly extinguished at 1 o'clock. The average time of burning for a light was 3955$\frac{1}{12}$ hours for the whole year. The total time of burning for all the lights was 38,865,411 hours. There were used 118,855 mantles; so that the average time a mantle was lighted was 327 hours, against only 146 in 1907. This difference is due to the use of copper-cellulose mantles. One hundred oil-lamps for the public lighting were also under the care of the gas-works. The mantles used for the public lighting were burnt-off at the gas works; and part of them were also impregnated there. A poun of nitrate of thorium, with 1 per cent. of nitrate of cerium, wa sufficient to impregnate 337 mantles,

With regard to financial matters, some figures may be c interest.

For coal used for carbonization was paid	£161,622	0	0
The average price per ton in the works was		15	11
Wages for carbonization, engine-drivers, &c.	28,934	0	0
Repair of the works	28,831	0	0
Repair of the mains	12,009	0	0
Total amount of wages paid	111,877	0	0
Furthermore, £2773 was paid to sick and wounded workmen.			
Wages paid to workmen during holidays, £3490.			

The cost of production per million cubic feet of mixed ga amounted to £128 16s. 11d., divided as follows:—

Coal	£75	12	6
Enriching		8	10
Purification		18	0
Wages for carbonization, engine-driving, &c.	13	10	9
Cost of coke manipulation, &c.	3	6	2
Manufacture of sulphate of ammonia	2	9	1
Manufacture of yellow prussiate of potash	1	5	9
Various expenses for manufacture	4	1	1
Works bathing and washing establishments		14	6
Repair of works	13	9	9
Total	£115	16	3
Receipts for bye-products (coke, tar, &c.)	55	11	9
Net cost of coal gas, without interest, and amortization	£60	4	6
Cost of water gas	56	7	3
Cost of mixed gas	59	3	9
Interest, amortization, use of gas at the works, &c.	30	13	8
Cost of mixed gas in the holder	£89	17	5
Cost of distribution	19	3	11
General expenses (salaries, &c.)	19	15	7
Total cost of the gas	£128	16	11

In the period of the concession to the Imperial Continenta Gas Association, the price of gas was 4s. 3d. per 1000 cubi feet through ordinary meters, and 4s. 9d. through prepaymen meters. Installations of prepayment meters are free, includin two boiling-burners and three burners, on condition that a mini mum of 14,150 cubic feet per year is used. Since Jan. 1, 1899 the price of gas has been 3s. 4d. per 1000 cubic feet througl ordinary meters, and 3s. 6d. through prepayment meters.

NEW USE FOR COAL-TAR PRODUCTS.

Manufactured "Trinidad Lake Bitumen."

A correspondent calls attention to another instance of the in exhaustible field for scientific research presented by a study o the properties of coal tar. It is the production, under Britisl patents, of the best quality of "Trinidad Lake Refined Bitumen" from a base of plastic pitch (denuded of all matter deleterious to electric cables—such as naphtha, phenols, and creosote) durin the ordinary course of a tar distiller's business, and in the ordi nary appliances in common use at a tar distillery; so that the residual product to be run out of the tar-still, instead of bein medium pitch, is the highest grade bitumen.

The proposal of the patentee—Mr. Thomas Marriott, of King ston-on-Thames—is to form a base of bituminous matter of a mixture of the last heavy distillate and medium pitch so as to produce a minimum of carbonaceous matter, which is not relied upon in the least as a stiffener to produce the required rigidity and high melting-point of a natural bitumen product. Under his process of manufacture, and while the plastic pitch is in a very hot melted state in the tar-still, there is added to it a proportion of a plastic mineral, undecomposable at any heat to which coal-tar pitch can be taken, and which is of the same kind as that so perfectly combined with the soluble matter in Trinidad Lake bitumen. In the new manufacture, it is used in practically the same proportion. The substance which gives to the natural product the premier position of all bituminous insulating compounds and their allied hydrocarbons (on account of the tenacity of its particles and stability, and which mineral is inherent therein in the form of an impalpable powder) is added to, and mechanically mixed with, the bituminous matter in the tar-still; thus forming a manufactured product that is identical with the natural one—the same tenacity of its particles, rigidity without brittleness, and equal stability.

Our correspondent points out that the cost of refining natural bitumen in order to form from it compounds suitable for joint, box, and trench use, is so high as to render the employment of the material so made in many cases prohibitive. Trinidad Lake bitumen is the only known bitumen stiffened with the high-class mineral mentioned; and compounds made from other natural bitumens and from pitches are brought to the required degree of rigidity for insulating purposes, under the processes in common use, by the aid of sulphur or excessive carbonization, with a tendency to crystallize or else rupture and permit the ingress of

moisture to the electric cable—thus leading to faults and leakages. Manufactured compounds of the class last described have been largely used from motives of economy, but with disastrous results; and there is a strong tendency at the present time among the chief engineers of the electricity supply undertakings to go back to Trinidad Lake bitumen compounds, notwithstanding their present high price. It is claimed by the patentee of the so-called "Vulco-Bitumen" manufactured compounds (which is the apt generic designation given to them by him) that he has the exclusive right under his patent to combine together ingredients the same as, or analogous to, those which constitute Trinidad Lake bitumen compounds, and in similar proportions; also that, under his original process (also patented) of intercepting melted pitch products containing a very high proportion of volatile matter in the appliances in which they are usually made, and adding thereto the stiffening substance referred to, he is "able to produce the highest class of manufactured Trinidad Lake compounds at a selling price of unprecedented cheapness—thereby offering efficiency with a great reduction in price."

It is mentioned that these new compounds will shortly be put on the market, and at prices enabling great economies to be effected in the construction, maintenance, and extension of electricity distributing mains; and the patents cover the assimilation of all pitches and bitumens to those of the Trinidad Lake class.

It has remained for a member of the legal profession with very strong leanings for scientific research to make this notable discovery. The inventor has, we understand, in his leisure time, for many years past studied tar distillation theoretically and practically at the works of a very eminent firm of tar distillers, who have given him facilities for pursuing his researches and testing the results of his numerous experiments in their laboratory; and he claims that the firm equally with himself are entitled to the distinction attaching to his most useful invention.

The earliest patent—No. 3063—was dated Feb. 7, 1907;* and the complete specification, accepted Feb. 6, 1908, pointed out that the invention claimed relates to the production of a "new product" made from coal-tar pitch and other material, and which can be used as a binder in asphalte paving and other uses to which ordinary bitumen is now applied. The product is practically unalterable in its molecular structure, and is thus more durable than, and superior to, pitches obtained merely by removing the oils from coal tar. The pitch used is soft in character, and is made by the arrest of the distillation of coal tar; but, as an alternative, ordinary coal-tar pitch can be fluxed by means of solvents to make it of the proper consistency.

The inventor's proposal is to mix coal-tar pitch with dry kaolin, or the like—the combination taking place while the pitch is in a melted state. The crude coal tar is distilled until it is reduced to the proper consistency; and then powdered kaolin or the like is mixed with it to the extent required. There is thus obtained a "judicious combination of materials all containing plastic elements in large proportions." The inventor, however, avoids the use of ground slate, fuller's earth, pumice stone, loam, marl, lime, sand, or anything of a gritty nature; and to this end the kaolin employed is preferably free from mica.

The distillation of the coal tar is arrested at such a period, after the temperature of 280° C. has been reached, as will bring the volatile matter in the still to any point required within the limits of proportion of 55 to 65 per cent.—thus retaining a considerable quantity of the tar or heavy green oils, as the distillation is stopped while the mass still contains 10 to 15 per cent. more of such oils than are retained in the ordinary medium pitch of commerce, which contains about 50 per cent. of volatile substances. To the mass, while hot, there is added, in any suitable mechanical mixer—such as is commonly used in the manufacture of coal-tar products—the dry, powdered kaolin or like high-grade clay containing a large proportion of kaolinite plastic substances. The addition of the kaolin has the effect of solidifying and rendering the product viscous and ductile; the proportion of kaolin added depending on the amount of ductility and hardness required.

As to the comprehensiveness of the words "kaolin and the like," the inventor points out that the best classification of minerals containing kaolinite plastic substances is in the technical work on "Clays" by Professor Heinrich Reis, Ph.D., published by Messrs. Chapman and Hall, in 1906. According to his authoritative classification, the words "kaolin or the like" are taken to include all high-grade clays containing a large proportion of kaolinite plastic substances—viz., kaolin, china-clay, fire-clay, potters-clay, porcelain-clay, and ball-clay. All these clays contain plastic elements in a much more marked degree than other aluminous minerals, and are generally grouped together in the book referred to. The "pitch," the residual product of tar distillation used in this invention, is the bulk product of the compound produced. The "aluminous matter" mentioned forms a comparatively very small proportion of the compound.

It is said that the product manufactured as described does not either crack in frosty weather or soften to the same extent in hot weather as ordinary soft pitch binders heretofore manufactured will do; also that when the heavy oils have never been volatilized they have a much stronger affinity for the pitch than when added as a flux. The product is therefore more stable; and in the manufacture of the pitch used it is preferable to arrest the distillation of the crude tar for asphalt work.

* Two subsequent patents have been taken out—No. 10,699 of May 8, 1907, and No. 11,498 of May 16, 1907.

In order to facilitate the manipulation of this product for asphalte work, it is advisable in some cases to add a certain proportion of flux or diluting liquid, either to the treated pitch or to the sand or fillers forming the bulk of the asphalte in which the new product is applied. In this case, however, the greater quantity of oils left in the pitch as manufactured renders possible the use of a smaller quantity of the flux than is usually employed—the reduction in the quantity of the flux used, together with the previous addition of kaolin, resulting in less susceptibility to change of form under heat, "which is a new and useful end obtained." In fact, the combination of coal-tar pitch prepared as mentioned with kaolin free from gritty matter, for the uses described, in the manner described—producing a viscous product having great ductility—is said to be "an entirely new manufacture."

HIGH-PRESSURE GAS DISTRIBUTION.

At the last Annual Meeting of the South-Western Electrical and Gas Association, Mr. Harry M. Moore, the Manager of the Austin (Texas) Gaslight Company, read a paper on "High-Pressure Gas Distribution for Commercial Purposes." The following are some extracts from the paper.

My first experience with high-pressure gas distribution was in the small town of Sycamore (Ill.). The main plant was located in a neighbouring town six miles away, and a line of 4-inch pipe was laid from the main to the basement of the office in Sycamore, where was stationed a duplicate system of regulators by which the gas was passed to the low-pressure mains for general distribution over the town. Only the consumers along the 4-inch line were supplied directly by high pressure. On this main we carried a pressure of from 10 lbs. to 30 lbs., which would not have permitted direct connection without some means of reduction; so at each residence we installed a separate governor or regulator by which the pressure was reduced to about 3 inches of water, or about 0·1 lb. steam pressure. This regulator was so connected that should it any time fail to perform its duty and allow the full pressure to pass, there was no danger to the occupants of the house, as a seal would be blown, and the gas thereby turned into the air. Our service along this line was highly satisfactory, but occasionally a seal would blow, and a heavy leakage would have resulted unless promptly attended to. On the low-pressure mains, the service could not be excelled, as there was practically the same pressure at all times, no matter how large or how small the consumption. During the nine months that I was in charge at Sycamore our pressure did not vary more than 2-10ths except at one time when a 3-inch main broke in two.

At Austin I have lately put in a high-pressure booster line, and it has demonstrated to my mind that high pressure is the solution of our troubles from small mains. In the early days of the plant, the greater part of the main laid was 2 inch. The plant grew until it was practically out of the question to supply some parts of the city during the heavy load periods of the day; so we laid $2\frac{1}{4}$ miles of 4-inch pipe as a high-pressure distributing line, and installed four No. 4 Reynolds district governors and a Westinghouse compressor, by which means we have overcome our trouble and very materially reduced our distribution labour cost.

Much has been said and written about the heavy leakage caused by high pressure. No doubt this would be the case where the mains were not originally intended for such service and not properly tested. But I do not find that my leakage has been very greatly increased, and when the line is entirely completed, I do not expect it to be any heavier; for I am testing under 45 lbs., seeing that each joint is tight, while I shall carry only 15 lbs. to 20 lbs. when I am through testing. But I save the expense necessary for taking out the large quantity of 2-inch pipe, and replacing it with larger main.

Mr. G. F. Goodnow, one of the best authorities on high-pressure distribution, says: "A mile of $1\frac{1}{4}$-inch pipe at 25 lbs. initial pressure will deliver as much gas as a 4-inch cast-iron main at 25-10ths pressure; and a 2-inch pipe under similar conditions will deliver as much as a 6-inch. A computation shows that a $1\frac{1}{4}$-inch and a 4-inch pipe a mile long will deliver under these conditions about 3000 cubic feet per hour, and a 2-inch and a 6-inch about 9000 cubic feet per hour. With fifty services per mile, the cost would be \$2362 for the 4 inch pipe and \$1317 for the $1\frac{1}{4}$-inch pipe." This shows what a great saving can be accomplished by high-pressure distribution. In the discussion on Mr. Goodnow's paper, much scepticism was shown; but to-day the most sceptical has become convinced that high-pressure gas-distribution is both efficient and economical, and that the old claim that there was a large loss of candle power caused by compression has not shown up in practice. Prior to the date of Mr. Goodnow's paper, I was furnishing gas with both high and low pressure in Sycamore (Ill.) with equally satisfactory results. I might cite many instances of the successful operation of high-pressure plants; but that of the North Shore Gas Company which supplies the part of the Illinois shore of Lake Michigan from Evanston to Waukegan, is sufficient. In the list of ten or twelve suburban towns on its line, all but one or two have nothing but high pressure, and all are being served excellently. For boosting low-pressure mains, high pressure is the most logical means that can be adopted; and, taken all in all, I am thoroughly convinced high-pressure distribution can be safely adopted for commercial purposes.

RESEARCHES ON THE CARBONIZATION OF TYPICAL ENGLISH COALS.

By Professor E. J. Constam and Herr E. A. Kolbe, of Zürich.

A communication to the "Journal für Gasbeleuchtung" of the 4th inst. gives the results of researches made at the Federal Fuel-Testing Laboratory at Zürich on the carbonization of a few typical English coals. It is supplementary to the reports of similar researches made by Professor Constam in collaboration first with Herr Schläpfer, and subsequently with Herr Kolbe, on typical German and French coals.*

The earlier researches demonstrated that the combustible substance of coals containing from 18 to 22 per cent. of volatile matter and of true anthracite had the highest calorific power. Chemical and calorific tests of a large number of samples of coal which Professor Constam collected in the course of a tour of English coal mines did not forthwith show agreement with this law; and it was therefore decided to make carbonizing trials of eight of these samples in the retort which had been used for the earlier series of researches. The relation between these small-scale trials and carbonization on a large scale was established by carbonizing also, in the small experimental plant, an English coal ("Kinneil") which had been exhaustively studied in the large scale plant at the Zürich Gas-Works.

Table I. gives the chief analytical results for the nine varieties of English coal examined.

It will be seen from the table that coals Nos. II., III., and IV. yielded practically the same percentages of coke, and, consequently, of volatile matter, in the retort trials; nevertheless the heats of combustion of these coals differed by over 500 B.Th.U.

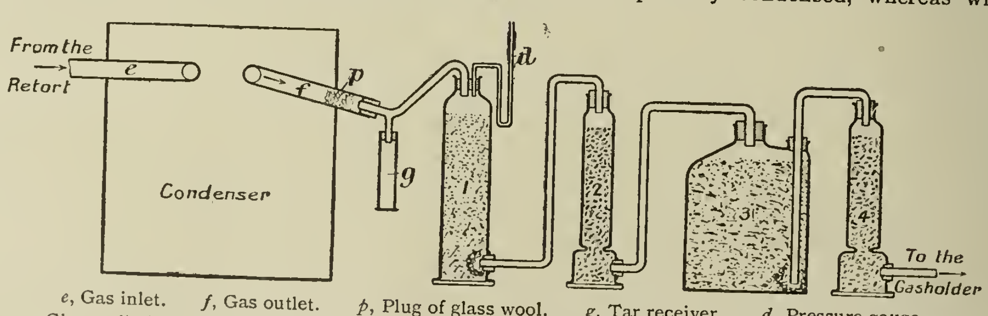
Table I.—*Composition and Calorific Value of the Coals.*

Description of Coal.	Moisture.	Ash.	Composition and Properties of the Coal Substance—(*i.e.*, the Coal Free from Water and Ash).									
			Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.	Yield of Coke.		Available or Free Hydrogen per 1000 Parts of Carbon.	Gross Heat of Combustion.	Net Calorific Power.
								In Experimental Retort.	In Platinum Crucible.			
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.		B.Th.U. per Lb.	B.Th.U. per Lb.
I. Nottingham, bright coal	9·60	3·06	81·38	5·30	10·20	2·02	1·10	59·7	56·37	49	14,522	13,918
II. Lancashire, Trencherbone	2·58	1·42	84·85	5·38	7·05	1·87	0·85	63·1	60·04	53	15,124	14,602
III. Nottingham, best hard	7·50	3·36	83·15	4·97	9·24	2·03	0·61	63·2	60·40	46	14,555	14,072
IV. Kinneil	2·36	4·11	83·99	5·55	9·23		1·23	63·7	61·60	55	15,032	14,494
V. Durham, Low Main seam	1·61	1·91	86·11	5·48	5·66	2·11	0·64	65·7	63·99	53	15,392	14,859
VI. Durham, Hutton seam	0·94	0·94	88·25	5·46	3·70	1·78	0·81	69·2	66·86	57	15,766	15,235
VII. Yorkshire, Barnsley	2·81	8·65	85·62	4·82	7·92	1·03	0·61	70·0	66·74	44	14,792	14,324
VIII. Durham, Ballarat seam	0·98	2·95	88·64	4·95	4·22	1·77	0·42	76·6	73·60	48	15,590	15,109
IX. Welsh, Nixon's Navigation	1·11	1·79	90·10	4·72	2·58	1·53	1·07	80·9	78·48	48	15,730	15,271

Similarly, the yields of coke of coals Nos. VI. and VII. were practically the same, yet the heats of combustion differed by about 900 B.Th.U. It will be shown that the cause of this divergence lies in the different composition and the resultant different calorific value of the volatile constituents of these coals. There is, however, a close relation between the heat of combustion of, and the proportion of carbon in, the combustible substance of the coals. The coals were purposely selected with but small differences in the amount of hydrogen contained in them, as an object of the trials was to clear up the cause of great differences in the heat of combustion of coals having the same proportion of volatile matter in them.

The carbonization tests were carried out in the same retort and at the same temperature as the earlier tests; but as the English coals were richer in gas and contained more water, a more effective condenser was provided. The gas circulated in the annular space between two water-cooled cones; the course of the gas being determined by deflecting plates or guides. The general arrangement of the apparatus is shown in fig. 1. A plug of glass wool (p) and a cylinder packed with sawdust were used to retain particles of tar. Actually the glass wool retained so much of the tar that the sawdust was only lightly coloured brown; and it served mainly to retain moisture. The rest of the moisture was removed from the gas by the calcium chloride. The increase in weight of the cylinders 1 and 2 was taken as a measure of the yield of tar and liquor. The purifier consisted of a two-necked bottle, charged with a mixture of sawdust and new oxide. The final cylinder of calcium chloride served to retain moisture taken up by the gas from the purifier. The increase in weight of 3 and 4 together was taken as the weight of sulphur compounds. The charges of half-a-kilogramme (1·1 lbs.) of coal were introduced in an iron container into the retort when it had been heated up to about 800-810° C. The gas from the first charge was in each case blown off into the open; being merely utilized to displace the air in the apparatus. The gas and other products from subsequent charges were collected and examined. The carbonizing temperature was maintained at about 810° to 830° C. The coke was not quenched with water, but was extinguished by shutting it up in an empty air-tight retort. The possible quantity of coke or carbon which could be consumed by this method of cooling is shown by calculation to be negligible.

Carbonization in the small retorts is distinguished from carbonization on the large scale by the fact that with the former the tarry and pitchy products escape from the short retorts as soon as they are formed. Owing to the shallower layer of coal, they cannot be partially condensed, whereas with large retorts a



e, Gas inlet. *f*, Gas outlet. *p*, Plug of glass wool. *g*, Tar receiver. *d*, Pressure gauge.
1. Glass cylinder packed with coarse sawdust. 2 and 4. Glass cylinders packed with calcium chloride.
3. Purifier charged with a mixture of sawdust and purifying material.

Fig. 1.—Arrangement of the Apparatus for the Carbonization Trials.

portion of the primary products of carbonization is condensed in the inner cold core, and there undergoes further decomposition. The yield of coke, therefore, falls somewhat lower on the small scale, and the yields of tar and pitch are higher. For instance, the yield of coke from Kinneil coal was about 2·7 per cent. lower in the small retort than in the large experimental plant at the Zürich Gas-Works, while the yield of tar was about 1·6 per cent. higher. The quantities of tar and liquor produced were determined in the same manner as in the earlier series of tests, and the chemical and calorimetric examinations were also made similarly. A summary of the results of the carbonization tests is given in Table II. They refer to the coal as tested, and not to the ash-free and dry coal substance.

It will be seen from the results given in this table that the quantity of coke obtained varied from 60 to 81 per cent. of the weight of coal carbonized. The tar obtained varied from 2·5 to 10·2 per cent., and its specific gravity from 1·157 to 1·200; while the yield of gas ranged from 11·2 to 20·3 per cent. by weight. The yield of tar is higher than on the large scale, owing to the difference already referred to in the conditions of carbonization. When

* See "Journal," Vol. CIII., p. 382.

Table II.—*Results of Carbonization Tests.*

Description of Coal.	Coke Obtained in Retort. Average Yield. Per Cent. of Coal.	Average Yield of Gas Per Ton of Coal. Cubic Feet at 60° Fahr. and 30 ins. Saturated.	Specific Gravity of Gas.	Yields of Products. Per Cent. by Weight of Coal.				
				Gas.	Tar.	Liquor.	Pitch (thick tar).	Sulphur Compounds.
I. Nottingham, bright coal	55·2	11,886	0·463	18·5	6·7	17·9	1·4	0·3
II. Lancashire, Trencherbone	62·0	12,697	0·475	20·3	10·2	5·7	1·3	0·5
III. Nottingham, best hard	59·7	11,076	0·475	17·7	8·3	12·7	1·2	0·4
IV. Kinneil	63·7	11,964	0·462	18·5	8·6	6·8	2·0	0·4
V. Durham, Low Main seam	65·3	11,674	0·433	17·0	9·2	6·2	2·1	0·2
VI. Durham, Hutton seam	68·8	12,253	0·427	17·5	7·6	3·9	2·0	0·2
VII. Yorkshire, Barnsley	70·6	9,744	0·393	12·9	5·9	8·7	1·6	0·3
VIII. Durham, Ballarat seam	76·6	10,999	0·347	12·8	2·5	6·4	1·6	0·1
IX. Welsh, Nixon's Navigation	80·3	11,790	0·321	11·2	3·1	3·8	1·3	0·3

coal is distilled in large ovens or chambers, a portion of the primary products of distillation passes at first into the cold interior core of the charge; and as the heat gradually reaches the interior, these distillates undergo further decomposition. This condition obtains to a less degree in ordinary inclined and horizontal retorts than in coke-ovens, chamber carbonizers, and vertical retorts; hence the yield of tar is lower with the latter types. In the experimental retort, the layer of coal is so shallow that practically no condensation of the products can take place in it, and the yield of tar is therefore large. The whole of the gas from the charges in the experimental retort came off in 60 minutes. With the coals richest in gas—viz., Nos. I., II., III., IV., and VI.—the bulk of the gas was evolved in from 15 to 20 minutes after charging; whereas with the coals poorer in gas, such as Nos. V., VIII., and IX., the bulk of the gas was evolved 20 to 30 minutes after charging. Coal No. VII. (Barnsley) behaved abnormally in this respect, owing to the different composition of its volatile matter. Though a poor gas coal, the bulk of its gas was evolved in from 15 to 20 minutes. Thus the course of gasification varies according to the description of coal, though the temperature of carbonization is the same.

With the rich gas coals there is smaller chance of decomposition of the volatile constituents; hence the yield of tar is higher. With the poor gas coals there is more far-reaching decomposition of the resultant volatile products, owing to the more protracted evolution of them. The researches were inteuded to throw light on the yield and quality of the coke, as well as of the volatile products, at the same temperature of carbonization for all the coals. It was desired to compare the yield of coke in the small retort with the yield in testing coal with the crucible. The results of the examination of the coke produced in the experimental retort from the different coals are shown in Table III. The average composition of the coke substance—the ash and water-free coke—for all the descriptions is as follows: Carbon, 96·59 per cent.; hydrogen, 0·76 per cent.; oxygen and nitrogen, 1·91 per cent.; sulphur, 0·74 per cent. The mean heat of combustion works out at 14,443 B.Th.U. per lb., whereas the earlier series of researches showed for twelve French and one Spanish coal a mean of 14,463 B.Th.U. per lb.

The pitch or thick tar produced contained from 0·83 (Low Main and Ballarat coals) to 2·81 (Trencherbone coal) per cent. of ash. The net calorific power of the ash-free pitch ranged from 13,757 B.Th.U. per lb. for Nottingham best hard coal to 15,519 B.Th.U. for Ballarat seam coal; and the mean for all the coals was 14,870 B.Th.U. The variations in the proportion of carbon in, and the heat of combustion of the pitch obtained from, the coals follow closely the variations in the corresponding figures for the combustible matter of the different coals. This correspondence between the pitch obtained from, and the combustible matter of, the coals had been observed in the earlier series of investigations. The proportion of carbon in, and the heat of combustion of, the tar obtained decreased as the yield of coke from the coals increased. This is evident from the figures given in Table IV. The tar from the Hutton seam coal exhibits an exception to the general relation referred to above, in that its heat of combustion and its content of carbon are higher than those of tars from coals containing a greater proportion of volatile constituents. For this reason, among others, this coal has a higher heat of combustion than would be expected from its proportion of volatile matter.

Table V. shows the more important characteristics of the gas obtained from the coals. The figures are the mean of two trials. The abnormal behaviour of coals Nos. III. and VII. is explained by the different composition and low calorific power of the gas obtained from them. The heat of combustion of the gas from

Table III.—*Composition of the Retort-Made Coke.*

Description of Coal.	Ash in Coke. Per Cent.	Moisture in Coke. Per Cent.	Fercentage Composition of the Pure (Ash Free and Dry) Coke.				Gross Heat of Combustion of the Pure Coke. B.Th.U. per Lb.	Net Calorific Power of the Pure Coke. B.Th.U. per Lb.
			Carbon.	Hydrogen.	Oxygen and Nitrogen.	Sulphur.		
I. Nottingham, bright coal	4·01	0.53	95·67	0·83	2·67	0·83	14,369	14,288
II. Lancashire, Trencherbone	3·11	0·34	97·19	0·70	1·38	0·73	14,357	14,288
III. Nottingham, best hard	5·65	0·55	96·26	0·77	2·54	0·43	14,328	14,251
IV. Kinneil	7·35	0·30	95·60	0·81	1·94	1·65	14,414	14,337
V. Durham, Low Main seam	3·65	0·13	96·01	0·84	2·44	0·71	14,476	14,393
VI. Durham, Hutton seam	1·68	0·23	96·39	0·91	2·01	0·69	14,459	14,371
VII. Yorkshire, Barnsley	12·21	0·31	97·03	0·89	1·65	0·43	14,501	14,414
VIII. Durham, Ballarat seam	4·01	0·28	97·16	0·87	1·43	0·54	14,571	14,486
IX. Welsh, Nixon's Navigation	3·04	0·22	97·13	0·72	1·04	1·11	14,548	14,476

coal No. VI., on the other hand, is high; and this, in conjunction with the high heat of combustion of its tar, explains why its heat of combustion is high relatively to its proportion of volatile matter.

From the figures arrived at in the investigations, heat-balances have been drawn up for the carbonization of the different coals. For the coal substance (*i.e.*, dry and ash-free coal) these are shown graphically in fig. 2. Table VI. also gives the proportions of the total heat of the original coal substance which are found in each of the products of distillation and the loss of heat in the process. The figures are percentages of the total calorific power of the coal substance. In the diagram (fig. 2), the abscissæ signify yields of coke and the ordinates calorific powers in B.Th.U.'s per lb.

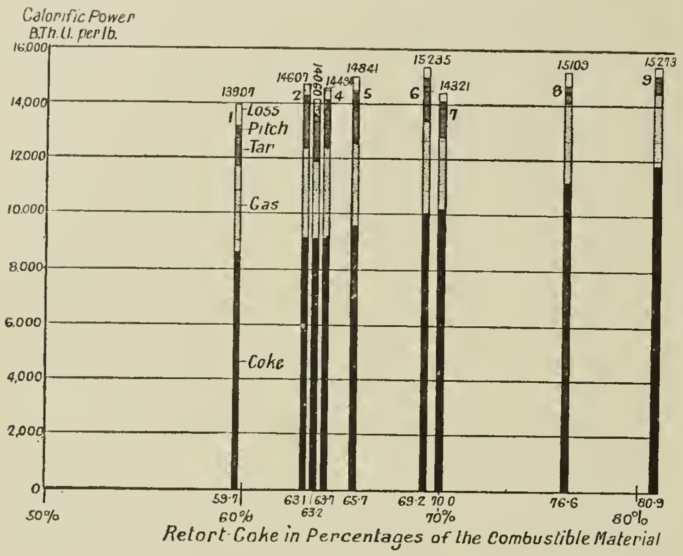
Table IV.—*Yield and Properties of the Tar.*

Description ot Coal.	Yield of Tar in Percentages of the Dry and Ash-Free Coal.	Specific Gravity of Tar.	Ash in Tar.	Carbon in Tar. Per Cent.	Net Calorific Power of Tar. B.Th.U. per Lb.
I. Nottingham, bright	7·7	1·165	Traces	87·34	15,152
II. Lancashire, Trencherbone	10·6	1·190	,,	88·13	15,151
III. Nottingham, best hard	9·3	1·168	,,	86·75	15,179
IV. Kinneil	9·2	1·163	,,	85·34	14,974
V. Durham, Low Main	9·5	1·170	,,	85·45	14,841
VI. ,, Hutton	7·7	1·200	,,	87·24	15,228
VII. Yorkshire, Barnsley	6·7	1·157	0·10 p.ct.	84·16	14,720
VIII. Durham, Ballarat	2·6	1·161	Traces	82·83	14,413
IX. Welsh, Nixon's Navigation	3·2	1·160	,,	79·70	13,860

It was shown in the earlier communication that for the coals then under consideration the highest gross heat of combustion or net calorific power was found with those varieties which contained from 18 to 22 per cent. of volatile matter, and with the true anthracites. The series of coals now examined, however, exhibits numerous exceptions to this rule. These exceptions are due to the fact that the chemical composition and the heat of combustion of the volatile constituents are not always functions of their amount. Very special stress must be laid upon this observation, because Goutal has proposed an empirical formula for calculating the heats of combustion of coals from the proportions of fixed carbon and volatile matter in them. This formula assumes that the heat of combustion of the pure coke from different coals is constant, and that the heat of combustion of the volatile matter is dependent on its amount. The first assumption rests on facts; and Goutal's formula gives useful approximate values in many cases, because in the majority of instances the second assumption, of a relation between the heat of combustion of the volatile constituents and their amount, is also correct. In a number of cases, however, the latter assumption is untenable, as Streit showed in

TABLE V.—*Composition and Quality of the Gas.*

Description of Coal.	Mean Srecific Gravity of Gas.	Illuminating Power in Slit Burner. English Candles per 5·3 Cub. Ft. per Hour	Gross Heat of Combustion. B.Th.U. per Cub. Ft.	Net Calorific Power. B.Th.U. per Cub. Ft.	Mean Composition of tbe Gas in Percentages by Volume.						
					Carbonic Acid.	Heavy Hydrocarbons	Oxygen.	Carbonic Oxide.	Methane.	Hydrogen.	Nitrogen.
I. Nottingham, bright coal	0·463	7·1	576	517	2·90	5·25	0·75	7·45	25·35	54·66	3·64
II. Lancashire, Trencherbone	0·475	10·2	611	559	2·20	7·60	0·60	9·77	28·94	48·08	2·81
III. Nottingham, best hard	0·475	6·5	569	509	4·15	5·55	0·90	11·49	24·27	49·62	4·02
IV. Kinneil	0·462	9·1	619	554	2·30	5·90	0·50	8·50	29·40	50·20	3·20
V. Durham, Low Main seam	0·433	10·0	627	564	1·70	6·20	0·75	5·02	32·43	50·70	3·20
VI. Durham, Hutton seam	0·427	9·9	647	586	0·90	5·85	1·00	3·62	31·20	51·43	6·00
VII. Yorkshire, Barnsley seam	0·393	6·2	589	531	3·50	5·70	0 80	8·27	24·80	51·98	4 95
VIII. Durham, Ballarat seam	0·347	6·5	609	547	1·30	4·45	0·75	2·94	29·78	56·10	4·68
IX. Welsh, Nixon's Navigation	0·321	2·6	538	475	1 00	2·65	0·80	4·13	24·08	63·04	4·30



COALS:

1. Nottinghamshire: Bright Coal.
2. Lancashire: Trencherbone Coal.
3. Nottinghamshire: Best Hard Coal.
4. Kinneil Coal.
5. Durham: Low Main Seam.
6. Durham: Hutton Seam.
7. Yorkshire: Barnsley Seam.
8. Durham: Ballarat Seam.
9. Wales: Nixon's Nr. 3 Rhondda Vein.

Fig. 2.—Heat-Balance of the Distillation of English Coals on the Basis of the Ash-Free and Dry Coal Substance.

TABLE VI.—*Heat-Balance of Carbonization.*

Description of Coal.	Heat Found in				Loss of Heat.
	Coke.	Gas	Tar.	Pitch.	
I. Nottingham, bright coal	61·3	22·7	8·4	1·6	6 0
II. Lancashire, Trencherbone	61·7	22·8	11·0	1 4	3·1
III. Nottingham, best hard	64·1	20·2	10·0	1·3	4·4
IV. Kinneil	62·9	22·0	9 5	2 1	3·5
V. Durham, Low Main seam	63 7	20 6	9 5	2·2	4·0
VI. ,, Hutton ,,	65·3	22·1	7·7	2·0	2·9
VII. Yorkshire, Barnsley ,,	70·4	18·3	6·9	1·9	2·5
VIII. Durham, Ballarat ,,	73·6	18·6	2·5	1·7	3·6
IX. Welsh, Nixon's Navigation	76·7	16·9	2·9	1·4	2 1

1906 in a special dissertation. He took the view that no general formula applicable to all types of coal could be established for calculating the heat of combustion from the ultimate analysis, but that it might be possible to deduce a practicable formula for each type of coal separately. The present investigation shows that this also is improbable, and that, therefore, the only permissible method of ascertaining the heat of combustion or calorific power of solid fuels is a determination by the calorimeter. While the authors have found that the calculated calorific power of coals is more nearly correct the more accurate is the ultimate analysis of the coal on which it is based, they would point out again that it is much more difficult and more tedious to make an accurate ultimate analysis than to make a determination in the calorimeter.

[The authors record their thanks to Herr Weiss, the Engineer, and Dr. Ott, the Chemist, of the Zürich gas undertaking, for the use of apparatus for the investigation.]

Eastern Counties Gas Managers' Association.—We are informed by the Hon. Secretary (Mr. T. A. Guyatt) that the Hull meeting of the Association will take place on Thursday and Friday of next week (the 23rd and 24th inst.). The technical programme will include Mr. John Young's Presidential Address, and the discussion on Mr. W. J. Carpenter's paper, which was deferred at the last meeting. Full details will be notified later.

MORE AMERICAN VIEWS ON COMMERCIALISM.

At the last Annual Meeting of the Illinois Gas Association, Mr. LUCIUS S. BIGELOW, the Publisher of the American journal "Light," read a paper on "Commercialism," from which we make the following extracts.

We can find all the way through history the visible manifestations of commercialism. The diplomat is a commercial man; for it is through his efforts, in many instances, that trade is created and remains undisturbed between countries. The engineer is, in a sense, a commercial man, because his endeavours are aimed at the production of that which, when disposed of, shall bring a return. It is quite possible, one can see, that an engineer may be a commercial man; but I think it would be difficult to point out how the purely commercial man could be considered as an engineer, unless of the special sort that has come into view during these later days—namely, the "business engineer."

"Commercialism" is indeed an exceedingly broad term, and might be considered as covering everything, from the chopping of the tree, the tilling of the soil and the growing of wool, to the selling of the finished product; or from the boring of the well to the operations of producing light, heat, and power from the products of the well; or from the mining of the coal and the ore to the finished piece of mechanism. In fact, we might go back to our citing of the "engineer," and state that he who surveys the land or who drafts the design is the man with whom commercialism in these days originates; but to bring this broad term into the scope of "gas commercialism" shall be the object of this paper.

At the last meeting of the Canadian Gas Association in Toronto, having been called upon to address that body on the subject of "gas commercialism," I pointed out how the manufacturer of appliances, through the mediums by which gas is converted into light, heat, and power, is the Alpha, while the commercial man of the gas company and the merchant who sells gas appliances may be looked upon as the Omega of gas commercialism; and certain it is that the one would be incomplete without the other. Therefore my deduction would be that, as each is of equal importance to the general gas enterprise, each should receive a like measure of consideration by the industry.

I have for a long period felt that the value of the manufacturer of gas appliances to the gas interests of the country has not been fully appreciated. In fact, I do not believe that the ability of the appliance manufacturer and the value of that ability to the gas man and to the gas industry have as yet been fully comprehended by many a gas man. It was a great pleasure to me, in promoting the organization of a gas association along strictly commercial lines, to have the appliance man recognized equally with the gas man in the membership. It was one of my suggestions that this should be done, believing fully that such an organization should stand for breadth, not narrowness—for the broadest commercialism, in its purpose of bringing together the three outlet sections of the gas industry, which are the manufacturer of appliances, the commercial gas man, and the merchant who handles gas appliances.

In regard to this last-named class of men, I believe that it will be of great benefit to the industry at large if the merchant can be generally brought into closer touch with these two other bodies of men in the industry, and thereby a better understanding be created between the manufacturer of appliances, the merchant, and the gas man. Though there are many who feel that the successful gas man will never relinquish to the merchant the handling of the sales field of appliances, I am not at all convinced personally that the time will not come when the commercial departments of a large number of gas companies will need to seek the close co-operation of the merchants. This does not say that certain trade is not already so conducted, nor does it say that some gas companies, having tried the plan of interesting the merchant, have found it a success as they conducted it. Nor does the fact that some gas companies have sought co-operation on the part of the merchant and have failed in arriving at a successful issue indicate to me that the plan is a general failure; for certain it is that some men will make a success where others fail, and perhaps the company who have not made a success of the plan might have done

so had the matter been handled differently, or had the time been more nearly ripe for it.

In a talk recently with one who is enthusiastic over the desirability of a technical education, I argued that without a very strong mixture of thorough commercialism it would result in his drawing $8 a week his entire life, while a combination of the two might be expected to equip him for a much better position. And yet specializing seems to be the order of the day; and so it was that in 1905 I suggested that the gas industry should specialize in a more complete manner than it had done in the past, and that there should be a recognized commercial side to the industry, and a representative of that division in the form of a Commercial Gas Association, as the other (the engineering) side was then predominantly represented by several Associations largely technical in their composition. Yet I would suggest that there is a possibility of too much of the element of specializing running in the veins of some people. For instance, the man who would study engineering without studying commercialism, as I have said, will usually only get about so far; and there he will stay. Let our engineering and our commercial gas associations keep in close touch. The danger referred to is less to be feared in the commercial field; for the same underlying fundamental principles which make a man a successful commercial man in, for instance, the machine field, will incline to make him successful in the gas or any other field. The man who has educated and trained himself up to the point of being a successful commercial man can easily adapt himself to almost any commercial field. Therefore it would seem to me that the men who have adopted commercialism in the gas field may, if successful there, look upon themselves as candidates for positions in any commercial field; whereas, the man who gives himself up solely to a profession must, as a rule, follow that profession, or else his earning power is gone.

Professions are necessary. However, I, for one, am perfectly willing that another should be a doctor, another a lawyer, and another an engineer; but give me commercialism. There is an enthusiasm about it that can hardly find a counterpart in any profession. The conduct of a business is like the playing of a game of chess. Unfortunately, however, only too frequently men overstep the bounds, and, in their endeavour to win the game, they forget the golden rule. Whatever others may say, I am as firm in the belief to-day as when I first had the motto given me that the keynote of true and lasting success is "Do unto others as you would they should do unto you." Unfortunately, this motto has been cartooned, as it were, and by many is looked upon as one of the sayings of childhood. But I tell you that in a vast number of cases where concerns have eaten up others this could have been avoided if men had used their ingenuity to discover new fields, or new branches in old fields, in which to build up and develop their energies. It is a misfortune that men are inclined to be copyists. A man brings out a good lamp, an arc, or an improvement in a range, and another man copies it. And so it goes on, instead of each exercising inventive genius and imagination, which if properly used would lessen the number of copyists, and would increase the number of devices created and perfected and of fields entered and won.

Commercialism is in every sense as high a type of occupation as ever was a profession. In fact, the commercial man who is honourable, straightforward, and in for the "square deal" only, is, in a sense, a stronger type of man than a purely professional man who follows along a beaten trail. In my opinion, temptation to crookedness is greater in the field of commercial men than in that of the engineer or of others who come in less frequent touch with the world of competition; and I believe, as a rule, the commercial man is a keener one than the professional man, by force of conditions. So to me commercialism ranks with the foremost occupations; and whether in the realm of Association work or every-day endeavour, my efforts will be for its advancement.

Tar Road-Surfacing and River Purity.

The protective effects of the use of tar upon highways are too well established for the employment of tar for the purpose to be lightly disturbed. The Thames Conservators, however, are making complaint. Discharges of an objectionable character into rivers and streams from surface-water drains have been observed; and the Conservators state that they have been advised that the increasing use of oily and tarry substances for dust prevention will prove detrimental to the river and subsidiary streams. They have therefore requested the Councils concerned to take precautions accordingly. It may be suggested to the Conservators that the oily deposits from motor cars have a greater continuous effect than any use of tar. Tar quickly gives the road treated a good waterproof crust; and this early becomes so hard that it is impossible for any oily substance to be extracted from it by rain. And a gain to the surface water is that the coating also prevents the washing down of any part of the loose top surface, as is the case with an untreated road. The oily droppings from motor cars, on the other hand, are a perfect nuisance, and are responsible for much annoyance and injury to the clothes of pedestrians by the splashings of the liquid oily mud by passing horses. Take Fleet Street as an example. On a wet day, an oily film can always be detected on any puddles of water in the roadway, and on surface water flowing along the side gullies. The mud in our motor-traversed streets has at least one constituent more than it used to have; and the surface water contains additional pollution—neither being an improvement on the conditions of our streets.

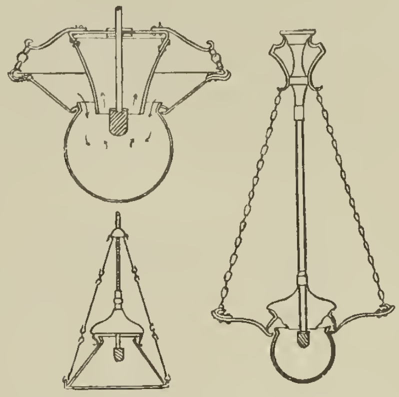
REGISTER OF PATENTS.

Gas Pendants and Burners.

Helps, G., of Nuneaton.

No. 15,143; July 17, 1908.

This invention relates to a gas-pendant in which short chains or like flexible connections are attached to fixed points on the fitting; while a reflector or globe-holder or the like is detachably fixed to the other end of the chains.



Helps' Pendant for Incandescent Burners.

The illustration shows three forms of the fitting; and these are understandable without further description, except to point out that the patentee claims, in such a gas-pendant (in which the burner and the reflector or globe-holder or the like can swing relatively to each other) the attaching of guards to the burner or to the reflector or the like so that the burner or mantle is protected from damage.

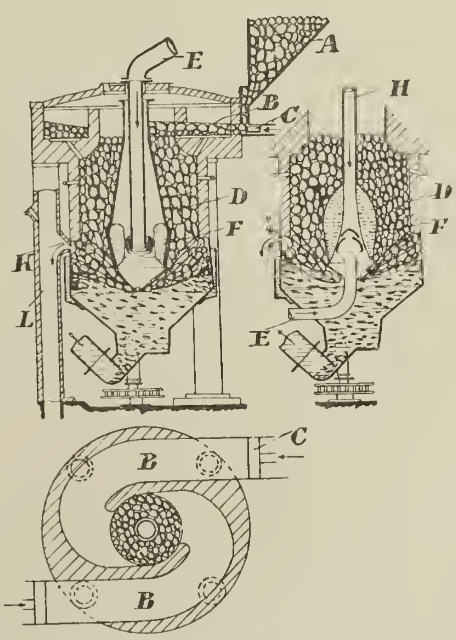
Gas-Producers.

Versen, B., of Dortmund, Germany.

No. 16,610; Aug. 6, 1908.

This invention relates to gas-producers with a central air supply-pipe extending into the combustion zone and another pipe extending to the zone through which the gaseous products of distillation from the upper part of the producer are supplied.

In order to reduce the risk of the clinker blocking up the lower part of the producer-chamber, it has already been proposed (the patentee remarks) to give the producer-chamber at this part a conical form—the chamber widening downwards. According to this invention, the risk is still further reduced not only by adopting the conical form for the lower part of the producer-chamber, but also by giving a conical form to the part of the air and gas supplying means on the same level as the conical portion of the producer-chamber—the conical part narrowing downwards. By the provision of the conical surfaces, the clinker always slides downwards, and will not block up the producer-chamber by forming a bridge between the air and gas supplying means and the sides of the chamber. The air and gas supplying means are preferably water-cooled, and water is preferably provided in the bottom of the producer-chamber; the object being to break up the clinker on the latter falling into it.



Versen's Gas-Producer.

Referring to the first arrangement shown, A is the hopper which conducts the fuel to one of two tangential feed channels B, along which it is conveyed by pistons C to the upper part of the producer-chamber D. E is the central air-admission pipe surrounded by a casing, between which and the pipe E products of distillation pass from the top of the

producer-chamber down to conical nozzle-rings arranged at the bottom of the pipe. A portion of the lower part of the casing is provided with a cooling water-jacket F; and its lowermost portion is (in accordance with the main idea of the invention) made of conical shape—becoming narrower downwards. The portion of the wall of the producer-chamber which is level with the lowest portion of the casing is also conical, but widens downwards, and is provided with a cooling water-jacket. The clinker therefore must descend into the bottom portion of the producer-chamber, which contains water for the purpose of disintegrating the clinker and enabling it to be removed by any suitable means. The gas produced leaves the producer-chamber at K and passes into a hollow column L.

In the second form, the air supply-pipe E enters below and discharges air up against a hood, by which it is deflected downwards along an extension of the pipe H down which gaseous products of distillation flow from the upper part of the producer—the hood being arranged in the pipe with an annular space between the edge of the hood and the pipe. The lower part of the pipe and its extension are provided with a cooling water-jacket F, and the lower part of the outer wall of the jacket is conical and becomes narrower downwards. The opposite part of the wall of the producer-chamber is also conical, but becomes wider downwards.

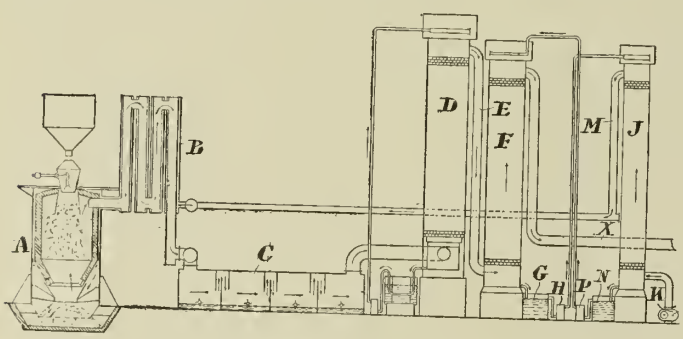
Gas Producer Plants Primarily Designed for the Recovery of Ammonia.

Crossley, W. J., and Rigby, T., of Manchester.

No. 17,978; Aug. 27, 1908. Renumbered and re-dated—No. 11,890; May 20, 1909.

This invention has for its object "improvements in working the type of plant known as an ammonia recovery gas producer plant," and relates to the recovery of the heat of the vapours given off during evaporation and crystallization of the sulphate liquor.

The processes at present in use with such plants, the patentees point out, are primarily designed to work at low temperatures; and in consequence a considerable proportion of the original nitrogen contained in the fuel is recovered in the form of ammonia. In order to make such a process an economic success, it is found necessary in practice to cool the gases leaving the gas producer to such a temperature that a great proportion of the sensible heat of the gases and the sensible and latent heat of the steam present in the gases is recovered. A portion of the sensible heat is recovered by superheating the air and steam on their way to the gas producers. To recover the greater portion of the remainder of the heat, it is usual to cool the gases and condense the water vapour present in them by means of circulating water or liquor, and which heat is afterwards recovered by regeneration in an air-saturating tower.



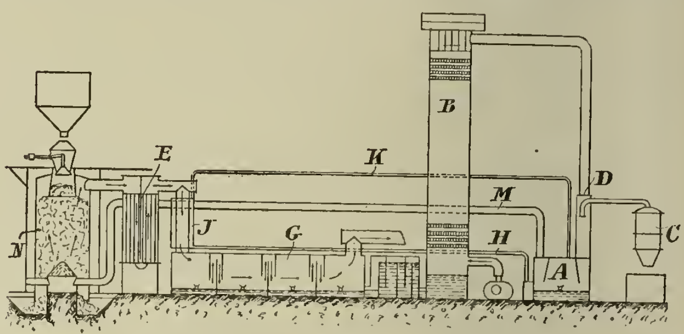
Modified Type of Mond Plant.

A diagram of the Mond type of plant is given first. The gases produced in A are passed through the superheater B before entrance into the mechanical washer C. In the washer they are cooled by water spray and freed from the dust they usually contain—leaving the washer at a temperature approximately 90° C. The gases are then passed through an acid tower D, where ascending through chequer work they are met by a stream of sulphate liquor containing free sulphuric acid in its composition, to absorb the ammonia present in the gases. Leaving the acid tower comparatively free from ammonia, the gases descend, by way of the pipe E, to the foot of the tower F, the function of which is to cool the gas to a still lower temperature and condense most of the water vapour present. This is effected by water, which is pumped up and circulated down the tower F through chequer work and in the opposite direction to the ascending gases. Leaving the tower F, the gases are usually taken away through a pipe X directly for use if intended for heating purposes, or are subjected to further cooling and purification if they are to be used in gas-engines. The water leaving the foot of the tower F in a heated condition passes into the tank G, whence it is pumped by the pump H to the top of the third tower J (known as the air-saturating tower), where, descending through chequer-work, it is met by air from the blower K on its way to the gas producers, and the intimate contact obtained causes the water to be cooled and the air to be heated and fully saturated with water vapour at the temperature it leaves the tower. The saturated air is then passed by way of the pipe M to the superheaters and gas producers, while the water leaving the foot of the tower J passes into the tank N, and is re-circulated by the pump P through the gas-cooling tower F. These interchanges of heat take place continuously.

An improved system was brought out by the present applicants (No. 24,144 of 1906), which mainly consists in washing and cooling the gases, condensing the water vapour, and absorbing the ammonia in one and the same apparatus. In addition to this, the actual sulphate liquor circulated is used for the purpose of simultaneously saturating the air with water vapour in the air-saturating tower, and simultaneously this action cools the liquor sufficiently for it to be used for re-circulation through the washing, condensing, and absorbing apparatus. By this means, a considerable reduction in the number of parts is made.

It is usual, it is mentioned, with both types of plant to keep the sulphate liquor in circulation at a strength of from 30° to 40° Twaddel. It is afterwards concentrated further in evaporating-pans for the purpose of crystallization of the sulphate in the marketable form; the mother liquor drained from the crystals being passed again into the sulphate liquor for circulation. While this evaporation is taking place in the pans, the vapours of evaporation are usually wasted; but in this invention they are treated in such a manner that they are recovered and passed into the gas producers as a portion of the auxiliary steam usually required.

The method found most practicable and is preferred is one where the vapours are arranged to saturate air intended for the gas producer before being washed by a suitable alkaline solution in order to neutralize any acids present in the vapours.



The Crossley and Rigby Type of Plant.

In the second illustration an alkaline washer A is used for the purpose of removing the acids contained in the vapours from the evaporating-pan C; and this is done by passing the vapours into the air-main D, conveying the saturated air from the air-saturating tower B—the mixture being washed by a heated alkaline solution in one and the same apparatus A. The alkaline solution in the washer is kept heated by any suitable means; but it is preferred to arrange that the liquor be circulated through a jacket J on the gas-outlet pipe from the superheater E and before entrance to the ammonia absorbing apparatus G. The liquor passes by means of the pipe H to the heating device J; the heated liquor being conveyed back to the washer by the pipe K. It will also be seen that the air leaves the washer by the pipe M, being thence conveyed direct to the superheater E, and so on to the gas producer N. The alkaline solution is usually heated at or above the temperature of saturation in such an arrangement so that condensation of vapour in the pipe M is reduced to a minimum.

It is found that with the present arrangement the air for the producers, instead of being saturated at about 73° C. as is usual from an air-saturating tower, is now saturated at nearly 80° C., without the addition of any steam from an auxiliary boiler.

Incandescent Gas-Mantles.

Layton-Fisk, J. W., of Cardiff.

No. 4860; Feb. 27, 1909.

The purpose of this invention is "to reinforce the ordinary makes of incandescent mantles . . . so as to render them proof, within the limits determined by the nature of the article, against vibration."

For this purpose the inventor melts silica with twice its weight of potassium silicate in solution, or, as an equivalent for the latter, with sodium silicate in solution, and dilutes the mixture with distilled water. He then takes a mantle of ordinary form and make, and dips it in the solution. After immersion, the mantle is first dried and then placed over a bunsen flame. He makes a mechanical mixture of highly pulverized refined talc, and "muschelkalk" limestone, in the proportions of 75 parts of the former to 25 parts of the latter ingredient in 100 parts. The mantle, while still warm from the effects of the bunsen flame, is sprayed with the mixture in a dry condition. The treatment is said to add considerable strength to the incandescent mantle, "making it much more durable than the mantle not so treated."

Automatic Gas Lighting and Extinguishing Apparatus.

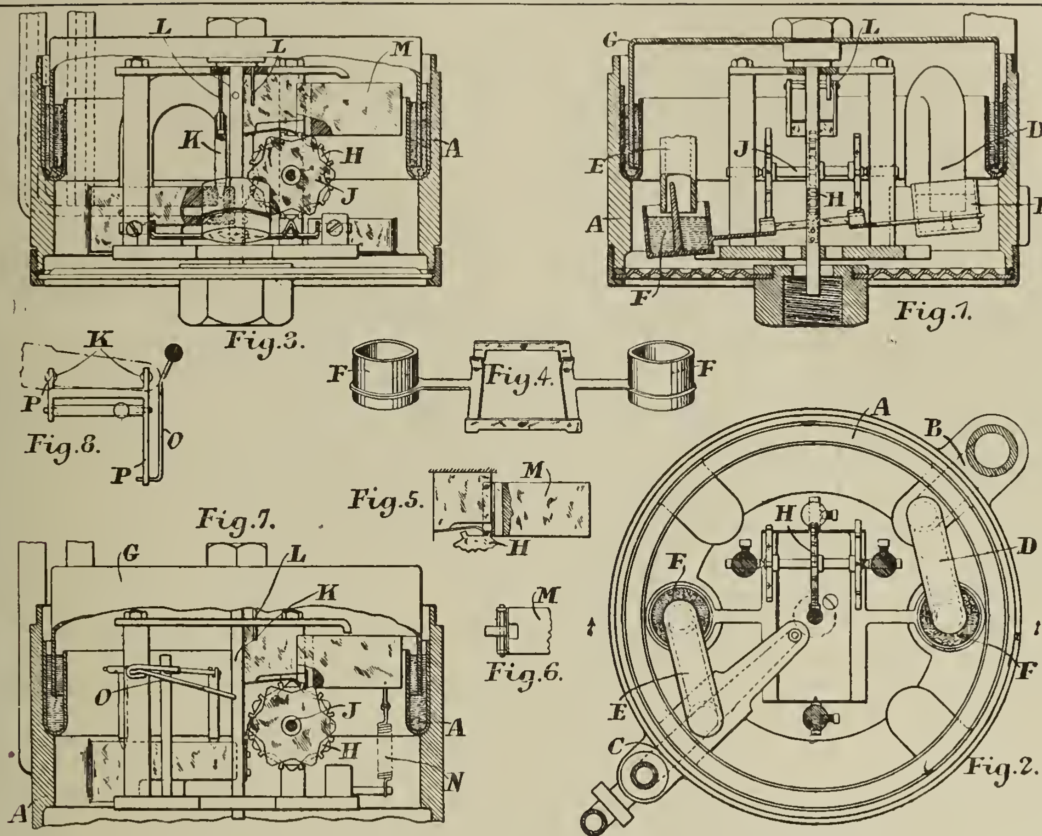
Bonniksen, B., of Coventry, and Berridge, T., of Leamington.

No. 20,348; Sept. 28, 1908.

This gas lighting and extinguishing apparatus is of the type described in patent No. 12,619 of 1907, in which mechanism is contained in a gas-chamber with which communicate two pipes, one leading to the burner, and the other to the pilot. The operating mechanism consists in a rocker carrying mercury cups, adapted to rock and cover or uncover the two pipes alternately under the influence of a small increase in pressure, according to requirements.

The present invention provides an "improved construction in which the necessity for a permanently open small bye-pass is dispensed with, although without disadvantages arising therefrom;" a further object being to provide means for ensuring the mechanism against accidental movement due to slight fluctuations in pressure.

The mechanism is contained in a chamber (in communication with the gas supply) in the side of which are two passages opposite to one another. The passage B communicates with the burner, and the other C with the pilot-jet. Communicating with the passages are pipes D and E, which are bent over into inverted U form; and underneath these lie cups F containing mercury, carried upon the opposite ends of a rocker or see-saw. Adapted to move vertically is a gas-bell G or diaphragm, so fixed to a spindle that it moves vertically under increase of pressure in the mains. The spindle actuates, by means of the wheel



Bonniksen and Berridge's Automatic Gas Lighter and Extinguisher.

H, a cam-shaft J or the equivalent, positively tilting the rocker by means of the cams; so that for one increase in pressure by the partial rotation of the shaft J the pipe E and passage C to the pilot are opened and the main burner extinguished, the next increase of pressure in the mains tilting the rocker under the influence of the cams and causing a reversal to take place—the gas-burner being lighted and the pilot extinguished in the well-known manner.

The mechanism so far described (forming no part of the invention) is only used to demonstrate the application of the invention to mechanism of this type.

As has hitherto been pointed out, however, the pilot may be accidentally extinguished before the burner is lighted; so that a separate gas-way must be provided to supply the pilot for a short time and ensure the lighting of the burner. The pilot passage C, formed in the wall of the chamber, is therefore extended and provided with a conical valve seat, with which co-operates a needle valve K carried by a vertically moving spindle. Thus directly the spindle moves vertically, under the influence of the increased pressure, the valve K is opened and a sufficient supply of gas to the pilot is ensured. Preferably the needle valve K is freely mounted on, or pivotally suspended from, the spindle, or one of the depending guides L thereon, so that it is free to centre itself in the valve-seat and ensure correct seating. For instance, the needle valve may be weighted and be suspended from one of the guiding pins L of the spindle by means of a cross pin on the pin engaging a transverse hole in the valve, as shown. This hole is preferably slightly larger than the cross pin, so that latitude is provided in all directions—ensuring accurate seating of the valve.

In previous constructions, it has been found that any slight fluctuation in pressure causes accidental movement of the mechanism. To obviate this, it is proposed to so suspend a weight M that it rests in front of a tooth of the driving wheel H of the mechanism, necessitating the driving wheel raising the weight at each action of the mechanism. By this means accidental movement of the mechanism is prevented. The weight may be provided with a spring N as in fig. 7.

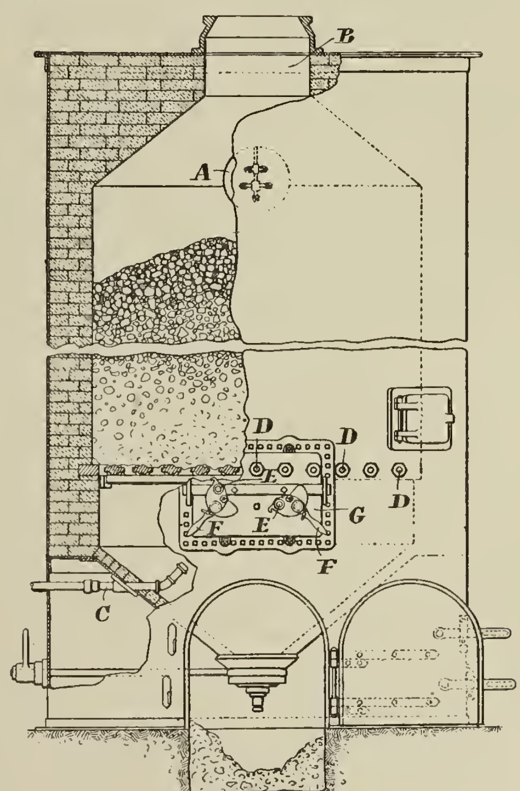
In some cases it is desirable that the bell G should stay at the top until it is desired to work the mechanism. In this case, it is necessary that the valve K should move in the opposite direction to the gas-bell G and its spindle. It is necessary therefore to introduce a lever between the valve and the spindle, so as to reverse the motion. Figs. 7 and 8 show how this may be effected. Projecting from the spindle is an arm O, which engages one end of a lever P carrying at its other end a valve K. There may, if desired, be two valves mounted on the same lever P. When, therefore, the gas pressure is decreased, the gas-bell and the spindle drop, raising the valves.

Water-Gas Generators.

M'Kay, W. E., of Norfolk, and Cheney, H. N., of Boston, U.S.A.

No. 4973; March 1, 1909. Date claimed under International Convention, Nov. 11, 1908.

This invention has for its object "to provide a water-gas generator adapted to continuously carry on recurrent process of generating water gas by the combination of the component elements of steam with incandescent coal or similar fuel." A water-gas generator of ordinary construction, the patentees remark, so far as the means for combining the elements with the fuel are concerned, is employed, and is also provided with a grate having movable bars, which are operable from the exterior of the generator; so that the base portion of the bed of fuel may be cleaned by suitably moving the grate-bars. The main feature of novelty of the present invention consists in providing such a generator with gas-tight sight openings below the grate, and arranged in such relation to the grate-bar operating means as to permit the gas-maker to ascertain the condition of the base portion of the fuel-bed while it is being cleaned—the gas-maker being, therefore, guided, so that he is enabled to determine when the fire has been cleaned to the proper extent, and thus avoid "such an excessive cleaning of the fire as would involve waste of fuel and injurious or destructive heating of the grate-bars."



M'Kay and Cheney's Water-Gas Generator.

The bottom of the water-gas generator is provided with a gas outlet and steam-inlet A, and a fuel-inlet B. C is a steam-conduit entering the lower or ash-pit portion of the generator below the grate. Air under pressure is supplied through an opening (not shown) below the grate; and there is also a gas-outlet (not shown) below the grate. The generator grate is composed of a plurality of movable bars adapted to be operated to shake down ashes and clinker from the base portion of the bed of fuel supported by the grate—means being provided whereby an attendant is enabled to move the grate-bars to clean the base portion of the bed in such a way as to prevent the escape of air or gas from the generator. Each grate-bar is provided with an individual operating member—a shank D having a squared inner end engaged with a socket in one end of the grate-bar, and a squared outer end adapted to be engaged by a crank or handle. This operating member passes through

a stuffing-box affixed to the wall of the generator, and adapted to prevent the escape of air or gas around the operating member. Each grate-bar preferably includes a cylindrical body portion which rests, and is adapted to turn on fixed supporting bars and wings projecting from opposite sides and separated by spaces which coincide with the supporting bars, so that the grate-bars may be rocked on the supporting bars without interference between the wings and the supporting bars. This construction permits each grate-bar to be independently operated, so as to be manipulated to any extent required by the condition of the fuel bed immediately above it.

It is highly desirable, and, in fact, essential (the patentees say), that the grate-bars be operated in such manner that the base of the fuel bed will be cleaned neither too much nor too little—an excessive cleaning of the base of the bed resulting in waste of fuel and a destructive heating of the grate-bars, while an inadequate cleaning impairs the efficiency of the operation. To enable the exact condition of the base portion of the bed to be ascertained by the gas-maker, sight openings extend through the wall of the generator below the grate in such position that the gas-maker is enabled, while the grate-bars are being manipulated, to conveniently inspect the portion of the ash-pit immediately below the grate, and ascertain, by the condition of the matter escaping between the grate-bars, when the portion of the bed above each grate-bar has been suitably cleaned. The sight openings have means for preventing the escape of air or gas from the interior of the generator.

Each sight opening includes a tube inserted in an opening formed in the wall of the generator below the grate, and a light of glass or other transparent material E adapted to fit the outer end of the tube and prevent the passage of air or gas. The transparent light is preferably mounted in a holder pivoted to a flange or head formed on the tube and provided with a handle F, so that it may be swung into position to bring the light into register with the tube when the sight opening is in use, and to move the light out of register with the tube and protect it from heat when the sight opening is not in use—a solid portion of the holder covering the sight opening when the holder is in the latter position.

Any number of sight openings may be employed—two being shown supported by a plate or cover G, which is detachably secured to the wall of the generator and covers an opening extending through the wall, partly above and partly below the grate.

The patentees close their specification by saying that they believe themselves to be the first to employ, in a water-gas generator having a grate composed of movable bars which are operable from the exterior of the generator without permitting escape of air or gas therefrom, one or more gas-tight sight openings located below the grate, and in such relation to the grate operating means as to enable the operator to conveniently inspect the portion of the generator immediately below the grate. These simple provisions, they say, make it entirely feasible and practicable to continuously carry on the recurrent process of generating water gas—a result which, so far as they are aware, has not before been successfully accomplished.

Temperature Measuring Apparatus.

Darling, C. R., of Plumstead, S.E.

No. 11,187; May 11, 1909.

This invention relates to apparatus for measuring temperatures by the thermo-electric method, which consists essentially in combining with a galvanometer a thermometer in such a manner as to compensate for the temperature of the cold junctions of the thermo-electric circuit, and so enable the actual temperature of the hot junctions to be automatically read off on the scale of the galvanometer.

It has been proposed to achieve this result by the automatic thermometric regulation of the indicating current—allowing for variations in the temperature of the cold junction. But according to this invention, the object is attained by utilizing the variations in temperature at the cold junctions to produce automatically a differential displacement of the galvanometer scale and pointer.

The inventor proposes that the scale of the galvanometer is made movable, and is actuated by the thermometer in such a manner that the temperature of the cold junctions, which are brought into proximity with the thermometer, is added to the normal indication of the galvanometer due to the difference in temperature between the hot and cold junctions. It then follows that when the circuit of the galvanometer is broken, the temperature indicated on the scale is that of the cold junctions.

Suicide by Gas at Plaistow.—A married woman named Mary Dullaghan, aged 27, living at Plaistow, who had for some time suffered from severe pains in her head, was found by her husband sitting in a chair dead. All the gas-taps in the house had been turned on by her; but the prepayment meter had by that time ceased to pass gas.

Whitchurch and the Ownership of the Gas-Works.—A letter has been read to the members of the Whitchurch District Council, from Mr. J. Williams, the Secretary of the Gas Company, acknowledging the receipt of a resolution passed by the Council and a rough draft scheme for the purchase of the undertaking. The writer said, however, that the Directors could not recommend the shareholders to entertain the scheme, nor were they prepared to submit alternative proposals. In their opinion, the only course for the Council, if they are really desirous of acquiring the concern, is to adopt the usual method of applying for statutory powers for the purpose, when the terms and purchase-price would be fixed in accordance with such powers. Subsequently, Mr. Elison said he thought it would be generally regretted that the overtures of the Council had been abortive. As to the suggestion that the Council should apply for statutory powers, the Directors must know that such an application would entail heavy expenditure, and that in a compulsory sale the ratepayers would have to pay a high price for the works. He hoped a more equitable way would be found; and with this object in view, he proposed that a special meeting of the Council should be convened in committee, to consider what further steps should be taken. This was agreed to.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Pre-Heating the Air Supply to Bunsen Burners.

Sir,—In the communication I sent you the other day regarding pre-heating the air supply for bunsen burners, and to which I am pleased to see you have given so excellent a place in this week's "Journal," I have, unfortunately, to ask you to kindly correct in your next issue a very awkward typist's error which occurred in the copy, and which I fear is too important to let pass.

In the table of temperatures, the figure given for the mean temperature at top of oven, in the right-hand column, reads 249·7° C., whereas it should be 294·7° C.—a difference of 50° C., which is, of course, so very serious a discrepancy as to render the comparison otherwise practically useless, though in summarizing the results further on in the article I give the figure representing the difference (50°) between these figures in the right-hand and left-hand columns, which would clear the matter up to anyone going closely into the figures.

I am very sorry to trouble you; but I think you will agree that the correction is one which should be made.

Essex Works, Birmingham, Sept. 8, 1909. H. James Yates.

West Bromwich Electricity Undertaking.

Sir,—Permit me to point out an error in your "Electricity Supply Memoranda" of the current issue. You mention West Bromwich as being among the accounts exhibiting slender surpluses—viz., £988. The net profit or surplus for the year ending March 31 last was £2442. The figure £988 which you give was the balance of profit made during the previous year, which was carried to a special depreciation and development fund, after the allocation of £800 in relief of rates, and £250 for extensions. The charges for current are among the lowest in the country.

Gas-Works, West Bromwich, Sept. 8, 1909. Harold E. Copp.

[We sincerely regret the error to which Mr. Copp kindly calls attention. Our source of information was apparently not so reliable as that of our correspondent, who, in his position, has, of course, access to the full accounts. Though opposed, generally speaking, to the principle of municipal trading, particularly when it is carried on to the injury of ratepayers and private enterprise, there is no desire on our part to vilify by misrepresentation. Therefore, we are indebted to Mr. Copp for calling attention to the inaccuracy.—Ed. J.G.L.]

High-Pressure Gas Lighting at Wolverhampton Skating Rink.—Referring to a paragraph obtained from a local source, which appeared on p. 652 of last week's issue, on the subject of a high-pressure gas lighting installation at the Wolverhampton Skating Rink, a correspondent writes: "You state that the skating rink is lighted by 30 Graetzin lamps, each containing five burners, and consuming 25 cubic feet of gas per hour, giving a light of 600-candle power. Might I ask if there is not some mistake here? Twenty-four candle power per cubic foot of gas consumed, as represented by these figures, is indeed low efficiency."

LEGAL INTELLIGENCE.

THE BANKRUPTCY OF MR. CHARLES SCOTT-SNELL.

At the London Bankruptcy Court last Tuesday, the public examination was held, before Mr. Registrar Giffard, of Mr. Charles Scott-Snell, Civil Engineer, of Heathside, Ockham, and late of Fairstead, Arthur Road, Wimbledon. The statement of affairs filed by the debtor disclosed gross liabilities amounting to £13,588, of which £5588 was due to unsecured creditors. To partly secured creditors there was due £8000, the value of the security being returned at £5000; thus leaving a balance of £3000 to rank against the estate for dividend, and making the total liabilities expected to rank against the estate amount to £8588. The assets were *nil*. The debtor informed the Official Receiver that the receiving order was made on his own petition; and he had been adjudicated bankrupt. Though by profession a civil engineer, he had not practised as such since 1882. For the past 25 years, he had been entirely occupied in inventing and perfecting various appliances in connection with gas lighting, steam-boilers, and domestic utensils, the patents for which he had sold to various companies formed to work them. In all cases, the consideration for such sale had been shares in the various companies, which were now valueless, as the undertakings had not proved successful. Since 1903, he had to a great extent been dependent upon borrowed moneys. He had been pressed by creditors during the last five or six years; and upon being served with a writ by a creditor for money lent, he decided to file his petition. He alleged his bankruptcy to have been caused through the failure in 1903 of one of the companies in which he had a large number of shares. He had not kept any books of account; but proper books were kept in respect of the various companies with which he was connected. His unsecured liabilities were mainly in respect of borrowed moneys. The claim of the partly secured creditor was in respect of money advanced to develop the Fairstead Estate at Wimbledon; and the bank who advanced the money held deeds of the property and shares in various companies formed to work his patents. He paid £8000 for the Fairstead Estate; but at that time he considered he was worth £50,000. The Scott-Snell Company had a paid-up capital of £50,000; and he

thought this would be sufficient. A subsidiary company was also being formed in America at the time to work the Scott-Snell patents; and if it had proved successful, he would have been a wealthy man, instead of a bankrupt. The examination was closed.

GAS COMPANY FINED FOR DISCONNECTING SUPPLY.

The Westhoughton Gas Company were, at the Bolton County Police Court, last Thursday, fined 40s. and costs for having, as alleged, illegally disconnected the supply of gas to the house of Robert Selfe, a superannuated policeman, residing in Wigan Road, Westhoughton.

Mr. A. F. Greenhalgh, in support of the case for Selfe, said that his client had been a gas consumer for over twenty years, and regularly paid his accounts as rendered. In the early part of this year the inspector for the Company reported that the meter had registered a consumption of 1600 cubic feet of gas for the quarter; but an account was rendered charging for a consumption of 2700 cubic feet. Selfe had an interview with the Manager to the Company, and offered to pay for the consumption of gas recorded by the meter. This offer was, however, refused; and on complainant declining to pay the larger sum asked for the Company stopped the supply.

It was submitted by Mr. Greenhalgh that the Company were only entitled to take the steps they had done if a consumer was in arrear with his payments or had not found security for payment. He also pointed out that a section of the Act provided that if any amount was in dispute, it had to be decided by two Justices of the Peace; but the Company had not adopted this course.

For the defence, evidence was tendered by the Company's officials that the meter at the house occupied by Selfe was out of order. It was also denied that he offered to pay anything prior to the gas being disconnected.

Mr. J. H. Hall, who represented the Company, at the conclusion of the proceedings applied to the Magistrates to state a case for the High Court. He said that the decision of the Bench to fine his clients was, under the circumstances, of far-reaching importance; and they might desire to carry the matter further.

After consultation, the Magistrates agreed to state a case.

Water-Works, Lighting, and Power Investment Corporation.

On the application of a debenture holder, Mr. Justice Neville, sitting in the Vacation Court, has made an order for the appointment of a Receiver and Manager of the Water-Works, Lighting, and Power Investment Corporation, Limited, for a period of three months—subject to the plaintiff filing an affidavit that the debt was due.

A Mantle Hawker in Trouble.

Last Thursday, at the Weston-super-Mare Police Court, Vincent Jones, who was stated to be connected with a well-known Cardiff family, was charged upon a warrant with obtaining 5s. by false pretences from Dr. George D. Grey, a Solicitor. Dr. Grey stated that when visiting a Mr. Bambridge, he saw the prisoner at the door in conversation with that gentleman, and exhibiting some incandescent mantles. Witness said to Mr. Bambridge, "You are buying some of these?" Mr. Bambridge replied, "Yes; they are very good." The prisoner then turned to witness and remarked that they were splendid mantles. Witness said, "Yes; but who are you? You are here to-day and gone to-morrow." Prisoner said, "Oh, no, certainly not; I am an agent for the Gas Company." The mantles, he added, were guaranteed for two years, but would last for three years. Witness said, "That is all very well, but who guarantees them?" Prisoner said, "The Welsbach Company." Prisoner produced an inverted mantle, and said they were 2s. 6d. each. Witness ultimately said he would take two, for which he paid 5s., and was handed the mantles in boxes by Jones. When he got home, he tested one, in accordance with the directions; and it simply fell to pieces. Subsequently he called at the offices of the Gas Company, and later on saw Mr. Bambridge, who produced a broken mantle. He then took out a warrant for prisoner's arrest. Jones called upon him and said that he had not represented himself to be in the employ of the Gas Company, but that gas companies recommended the mantles; and that all he had said about the Welsbach Company was that his mantles were better than theirs. Witness asked prisoner how much he gave for the mantles, and he replied 1¾d. each; but the difference between that and the 2s. 6d. he charged for them was made up by the guarantee which was given by himself and his two brothers—who were then mentioned for the first time. Upon this, witness telephoned for the police. In answer to Mr. Lloyd, who defended, witness admitted that prisoner's name and address were upon the boxes. He had asked the police subsequently if he might be allowed to withdraw the warrant; but his desire to stay proceedings would have been conditional upon prisoner leaving the town and making a donation to some charitable institution. Prisoner, in giving evidence, said he was engaged by his brother as an agent for the sale of incandescent mantles. He had sold thousands of the upright mantles, and had never had any complaint. He did not tell Dr. Grey anything about the Gas Company, or that he represented them. In regard to the Welsbach Company, the only thing he said was that his mantles were better than theirs. He denied that he had ever mentioned the name of the Gas Company in any of his business transactions. Prisoner was committed for trial at the next Assizes; bail being granted in the sum of £50 and one surety of £50.

Company Fined for Cutting-Off a Water Supply.

At the local Police Court, the Canterbury Gas and Water Company were summoned by Mr. Henry Baker, Licensee of the "Fleur de Lis" Tap, for a breach of the Water-Works Clauses Act of 1847 by wrongfully cutting-off his water supply. The complainant was the tenant of Mr. Sanderson, the proprietor of the "Fleur de Lis" Hotel. By the agreement between them, the landlord was to pay the water-rate; and by arrangement existing between Mr. Sanderson and the Company—the origin of which both parties said they were unable to trace—Mr. Sanderson was supplied at £3 a quarter minimum. The Company claimed to be unaware that the supplies to the "Fleur de Lis" Tap and Messrs. Hollamby and Williams, a clothiers' premises, which originally formed part of the hotel, but are now let off for separate occupation, were supplied through the hotel meter. On discovering this, they made an offer to Mr. Sanderson, which they claim that he had accepted, that the two let-off portions of the original premises were to be rated separately. The acceptance of the new arrangement by Mr. Sanderson was denied; but it was said he had paid £2 15s. 3d. "on account," which included the amount for the Tap, and because he refused to pay an item of 6s. 3d. which was charged for the Tap separately—and thus to pay for the Tap supply twice over—the Company, who were amply secured by the hotel premises, instead of adopting the procedure against the owner which the law provided for them, wrongfully cut off the water of the tenant, who had been without a supply ever since. Mr. Arrowsmith, for the defence, said some question had arisen between Mr. Sanderson and the Company; and they, on looking into the matter, found that the supplies for the three occupations all passed through the hotel meter at the one minimum rate of £3, which clearly was "not good enough." The Directors accordingly passed a resolution authorizing the charges embodied in a letter to Mr. Sanderson—the reduction of the minimum for the hotel to £2 15s. a quarter, but the let-off premises to have distinct supplies. Messrs. Hollamby and Williams signed the usual application form which was sent to them in reference to this; but Mr. Baker did not. The Company had been too lenient, and allowed the thing to drift. He contended that the Company could not be required to supply the Tap otherwise than by meter or by special arrangement. Whatever the arrangement was prior to March 25, it could not affect the question now. The Company's letter stating that the Tap would no longer be supplied as part of the hotel, and that a reduced minimum rate of £2 15s. would be charged for the hotel, was the only arrangement which had been accepted by Mr. Sanderson. It was accepted by his act in paying the £2 15s. instead of the £3 he usually paid. Evidence was given by Mr. James Burch (Secretary and General Manager to the Company) and Mr. C. H. Page, the Engineer. In reply to a question as to what was the preliminary reason for cutting off the supply, Mr. Burch said that in the first place it was a supply in contravention of the Company's regulations, and, secondly, as the water had been used at the Tap, it was only right that it should be paid for. Ultimately the Magistrates decided that the Company had contravened section 4 of the Water Companies Regulation of Powers Act of 1887; and they imposed a fine of £1 and payment of court fees, 17s. 6d. The Bench also allowed £2 2s. Solicitor's fees.

Inverted Street Lighting in Deptford.

At the meeting of the Deptford Borough Council last Tuesday, the Lighting Committee reported having considered three proposals by the South Metropolitan Gas Company, in regard to the alteration of the remainder (the Council having already ordered the conversion of the No. 3 and No. 4 burners) of the street-lamps to the inverted type. Mr. J. Sutcliffe, the Borough Surveyor, said the first scheme submitted by the Company was for converting the burners of the whole of the lamps throughout the borough. The second was for the conversion of the lamps in the 48 principal streets, with lamps 555 of which had No. 2 burners, 47 had double No. 4 burners, and 4 had triple No. 4 burners; and the third was for the conversion of the lamps at the corners of the principal streets. At present, there were lamps at these corners, 138 with No. 2 burners, 8 with double No. 4 burners, and 4 with triple No. 4 burners. The Company offered to execute the work of conversion at the following prices: No. 2 burners, 3s. per lamp; double No. 4 burners, 9s. per lamp; and triple No. 4 burners, 15s. per lamp. Under No. 1 scheme, the cost of conversion would be £261, and the increased expenditure per annum £880; the cost of conversion under No. 2 scheme would be £107, and the increased expenditure per annum would be £302; while under No. 3 scheme the respective amounts would be £27 and £75. The Committee went on to report that, after full consideration, they had come to the decision that it was most desirable that the whole of the lamps of the borough should be installed with the new type of burner. They desired to emphasize the fact that the inverted burner gives a light of 120 candles, whereas the present No. 2 burners have a light of 40 candles only. They accordingly recommended that the first scheme be adopted by the Council. The Council referred the report back to the Committee, with instructions to bring it up again in a month.

Death at a Gas-Works.—At Castletown, Isle of Man, an inquest was held some days ago on the body of Alfred Callow, 48 years of age. It appeared from the evidence that while the deceased was engaged in cleaning out a purifier at the Castletown Gas-Works, he was overcome by the fumes. As rapidly as possible, he was rescued from his position; but all efforts to restore consciousness failed, and his death ensued. The Jury returned a verdict of "Death from asphyxiation;" and they added a rider to the effect that the deceased was working at very dangerous employment, and that greater precautions should be taken to ensure the safety of men engaged in such operations.

Gas Supply of Little Hulton.—The Gas Committee of the Little Hulton Urban District Council have interviewed a Sub-Committee of the Salford Corporation Gas Committee; and arrangements have, it is stated, been come to by which the Council will purchase the whole of the Corporation gas undertaking within their district. The Council will proceed to obtain the necessary parliamentary powers; and the Corporation will continue to supply gas till the scheme is completed. Lord Ellesmere has offered to supply the Council with gas from the coke-ovens in Middle Hulton. Proposals have also been made to the Farnworth and Kearsley Gas Company, who supply the other half of the township, to sell that portion of their undertaking to the Council.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GASLIGHT COMPANY.

Increased Sales of Gas—Company's New Provisional Order.

The One Hundred and Ninth Ordinary General Meeting of the Sheffield United Gaslight Company was held on Monday of last week, in the Cutlers' Hall, Sheffield—Mr. Wilson Mappin presiding.

The Chairman, in moving the adoption of the Directors' report and the balance-sheet, said that since they last met there had been but little improvement in business generally. So far as Sheffield was concerned, trade had remained somewhat stationary. It might, however, be hoped that, with the giving out of orders by the Government for new ironclads, a fair proportion of the work would find its way into Sheffield, which would tend to do away with the unemployment they had had to deal with for several winters past. It always appeared to him that building ships was one of the best forms of relief work, as it found employment for men of all classes, from the highly skilled mechanic to the labourer, at full wages, which wages were spent on food and clothing and other comforts of life—thus making work in many other branches of trade; while temporary relief works provided by the Government or local authorities could only be paid for at a low rate, and were often of very little use to the community when completed, whereas additions to the Navy at all events conduced to our sense of security. So far as the Company were concerned, they had little reason to complain, as the sale of gas, notwithstanding the state of trade, had exceeded the corresponding period of 1908 by 20,651,000 cubic feet, or 1·23 per cent. As this gain was on the somewhat abnormally large increases shown in the June half years of 1907 and 1908, it must be regarded as being quite satisfactory. Coming to the balance-sheet, the first item shown was coal, which had cost £8366 less, purifying was £223 less, wages £882 less, repairs of works £1213 less, and repairs of mains and services £591 less. The principal items which showed increases on the expenditure side were repairing and refixing meters £242, rates £756 more (making the total paid for rates in the half year £9816), stationery and printing £123 more, general establishment charges and incidentals £159 more, and interest on debenture stock £332 more. On the other side, they had an increased income from gas of £1335, from meter and stove rents £209, and from earnings of the Company's railway waggons £372. Against this, there was a decrease of £7305 from coke, of £472 from tar, and of £781 from sulphate of ammonia; the net result being an increased profit of £2080 over the corresponding period of last year—leaving, however, a deficiency in the sum required to pay the dividend of £6675, which would reduce the amount of the balance to carry forward to £74,767. The average price at which gas was sold during the half year was 1s. 2·92d. per 1000 cubic feet. As he had explained on previous occasions, the Directors, when making the last reduction in the price, took into account the surplus carried forward, and expected to have to draw upon this from time to time to make up the sum required for dividend. The illuminating power of the gas supplied during the half year was 17·31 candles, which was the average of 1138 tests made by the Corporation chemists and the Company's officials. The following figures would show that the Company's business continued to progress in all directions. During the half year, there had been sold 577 gas-fires, 863 boiling and grilling stoves, and 7873 incandescent burners, and 338 additional cooking-stoves had been let on hire. Besides this, the Company had been doing a very considerable business in gas-furnaces—about 40 additional ones having been fixed. The following were some of the purposes for which they were used: Brass casting, silver melting, annealing dies, table-blade forging, bayonet forging, file hardening, testing steel, hardening steel, forging cutters, forging mining drills, case-hardening, hardening chisels and twist drills, forging forks, forging files, tempering knives, &c. There was little doubt that when the furnaces became better known there would be hardly a firm in Sheffield who would not find it advantageous to use them for one purpose or another. The Company had furnaces on show at Shude Hill, and invited manufacturers to bring their material there in order to test what could be done with them. There had been fixed during the half year 29 addition gas-engines, varying in size from ½ H.P. to 145 H.P.; the total horse power being 746½. During the past twelve months, 345,875,000 cubic feet of gas had been supplied to engines, which was an increase of 14,252,000 cubic feet over the previous twelve months. For many years past, the Company in the summer and autumn months had been a good deal troubled with naphthalene, although during the last few years, owing to measures that had been taken, the number of complaints had been greatly diminished; and he was pleased to be able to inform them that this year it had almost entirely disappeared—only 22 complaints having been received up to the present time.

The Lord Mayor, in seconding, said they would gather that the record was one of increased work and increased profit, although the profit had not been quite sufficient to pay maximum dividends without dipping into the balance. If the Chairman had taken them more into his confidence, he would have prophesied that in the next report the profits would be shown to be almost, if not quite, sufficient to pay the maximum dividend.

Mr. James Rhodes asked if the decrease in the receipts from residuals was likely to be permanent, or was it an exceptional half year.

The Chairman replied that the reduction was chiefly in coke, of which they had now a very large stock. The price, as well as that of sulphate of ammonia, was ruled by the market. When trade improved, prices would probably advance.

Mr. Rhodes asked if the reduction was due to competition from collieries, who were selling a great amount of residuals.

The Chairman said they could get quite as much as other companies.

The report and accounts were adopted, and the maximum dividend, at the rate of 10 per cent. per annum, was declared.

Sir Robert Hadfield, Mr. H. K. Stephenson, and Mr. B. George Wood were re-elected Directors.

An Extraordinary Meeting followed, at which it was decided to modify the apparatus for testing the quality of the gas supplied by the Company, and to reduce the standard for the illuminating power; to authorize the holding of ordinary meetings of the shareholders annually, instead of twice a year as hitherto; to permit debenture stock to be offered for sale by tender as well as by auction; and to confer upon the Company all such other powers as may be necessary or expedient to carry into effect the objects of the intended Provisional Order.

The Chairman, in explaining the objects for which the Order was required, stated that, with regard to the illuminating power, since the year 1900, when the late Sir George Livesey convinced Parliament that gas of high illuminating power was, owing to the introduction of the incandescent burner, no longer necessary, all the gas undertakings (42 in number) who had obtained fresh Acts of Parliament or Provisional Orders had been allowed to reduce their standard to 14 candles, with the exception of two quite small places—viz., Matlock Bath and Bognor—who applied for, and were granted, a 15-candle standard; and 18 further undertakings had applied for a 14-candle standard this year. The burner by which the Company's gas was tested was now out of date. It did not give the best result for the gas consumed. In 1905, Mr. Charles Carpenter, the present Chairman of the South Metropolitan Gas Company, invented a burner which allowed for the correct adjustment of the air supply to the gas-flame. This burner was at once adopted by the London Gas Referees as the standard for the Metropolitan Companies, and had been allowed to all gas undertakings who had applied to Parliament during the last three years. The object the Company had in view was to discontinue enriching their gas by the use of cannel, which year by year became more difficult to procure; many of the pits where it was obtained having become exhausted. Although the Company were seeking for a 14-candle standard, which would place them on the same basis as other undertakings who had obtained recent Acts of Parliament, it was not the intention of the Directors to reduce the quality to that point. There would probably not be more than half to one candle difference in the illuminating power of the gas supplied; but it would enable the Directors to take advantage of new methods of carbonizing which might from time to time develop. All they desired was to avoid the cost of enrichment, which, under present circumstances, was money thrown away; and there would in reality not be a very great difference in the illuminating power. One thing the shareholders and the public might be quite assured of, the Company, in the face of competition with electricity and oil, would not do anything that would be likely to be in any way injurious to their business. Their future object would be the same as it had hitherto been—viz., to give satisfaction to their customers. It was also proposed that there should only be one meeting of shareholders in each year. For the last three years the number of shareholders present at the September meeting had been 10, 14, and 12 respectively; and he thought all would agree that it was unnecessary there should be more than one meeting per annum. The accounts would be audited each half year as hitherto; and the dividends would be sent out as usual. With regard to the sale of debenture stock by tender as well as by auction, he explained that the reason for obtaining this power (which all other gas undertakings had) was that in June, 1908, when £30,000 of debenture stock was offered, only a portion of it was sold; but after the sale a number of applications for it were made to the Company, which, under present conditions, could not be entertained. There were many people with money to invest who did not care to go to auction rooms, but who would be quite ready to take the stock if it was offered to them for sale by tender. The shareholders, of course, would understand that the object the Directors had in view was to obtain the best price possible.

Mr. Hanbury Thomas moved, and the Chairman seconded, that application be made for the Provisional Order; and the resolution was carried.

Mr. Thomas Richardson proposed a vote of thanks to the Chairman, the officers, and staff. He asked if the saving by the reduction of the candle power would be sufficient compensation for the cost of the Order.

Mr. John Ellis seconded the vote; and it was carried.

The Chairman, in reply, said the cost of the Order would not be more than £200; they were not asking for an Act of Parliament.

HARROW AND STANMORE GAS COMPANY.

Business Doubled in Six Years—Additional Capital Required.

The Half-Yearly Meeting of the Company was held on Monday last week, at the Holborn Restaurant—Mr. A. H. Baynes in the chair.

Mr. J. L. Chapman (the Secretary and Engineer) having read the notice convening the meeting, the report and accounts were taken as read.

The Chairman, in moving their adoption, said his first words must be of congratulation on the further progress of the Company during the half year—progress which, the Directors felt, was largely due to the strenuous efforts of the Engineer, and of the competent staff associated with him, in the conduct of the business. It might not, perhaps, be out of place if he referred to some of the results of the working of the Company during the six months. First, as to the gas-rental. Comparing the receipts for the half year with those of the corresponding period of 1908, they exhibited an increase of £1526, although the price of gas had been reduced by 1d. per 1000 cubic feet throughout the whole of the district. The receipts for the hire of meters, stoves, and house fittings presented an increase of £221; and for residuals of £263. The latter amount would have been much larger but for the fact that values had greatly depreciated during the past six months. The quantity of coal carbonized was 1011 tons in excess of the amount used in the corresponding half of 1908, at an increased cost of £859. Some 5055 gallons of oil more had been used than in the first half of 1908; and the increased cost of oil was £140. There were advances in certain other items of expenditure. By an addition to the workmen's insurance fund, this now amounted to £315; and an allowance of £734 had been made for the

depreciation of coin meters, house-services, and stoves. The receipts of the half year totalled to £20,934—an increase over 1908 of £2055. The total expenditure was £14,607, or an increase of £1594. The make of gas in the half year was 95,271,000 cubic feet, of which 70,143,000 was coal gas, and 25,128,000 cubic feet carburetted water gas. The coal used amounted to 6321 tons, from which was produced, on an average, 11,096 cubic feet per ton. The quantity of oil used was 59,265 gallons; and per 1000 cubic feet, 2·35 gallons. The amount of gas sold was 90,800,000 cubic feet, or an increase of 10,501,000 cubic feet, which was rather more than 13 per cent. above the corresponding period of 1908. In this connection, it was interesting to note that the quantity of gas sold was equal to 95·32 per cent. of the quantity made, and there was used on the works 1·22 per cent.; so that the unaccounted-for gas was 3·46 per cent. With regard to the capital account, the proprietors had doubtless noted that during the half year there had been considerable payments. A sum of £699 represented the expenses of the arbitration and legal charges connected with the purchase of new land, which was absolutely called for by the growth of the business. Upon the building of new show-rooms, and providing larger office accommodation, £733 had been spent. A sum of £3050 was the cost of laying new mains and service-pipes to meet the demands arising from new roads and houses in the Company's rapidly growing district. On new meters, £212 had been spent; and on new stoves, £631. In March last 1000 "C" shares were sold by tender, producing a premium of £4500, which sum was added to capital, but received no dividend; and subsequently £4480 of 4 per cent. debenture stock was allotted to applicants. Reverting to the half-year's working, the total profits amounted to £6327—an increase over the first half of 1908 of £461. Debenture stock and interest on loans would require £821; and the dividend recommended would need £4966—leaving a balance of £539. It was proposed to carry to the reserve fund account the balance due from the reduction in the price of gas—viz., £317—and to carry £222 to the previous balance of £4122, which would give a sum of £4344 to be carried forward to the new account. To meet the continually increasing demand for gas, the Directors had entered into a contract with Messrs. John Aird and Sons for the construction of a gasholder tank; the contract to be completed in October next. They had also made a contract with Messrs. Cutler and Sons for the construction of a holder to contain rather more than 1 million cubic feet—this contract to be completed in July next. In pursuance of notice, at the close of this meeting, an extraordinary meeting would be held to authorize the Directors to raise the balance of the capital which they were entitled to sell under the Company's Act of 1903. In conclusion, he said he ventured to think the record for the half year was a very satisfactory one. It reflected great credit upon the Engineer and the staff working under his superintendence; and he (the Chairman) was sure the proprietors would join heartily with the Board in this expression of appreciation for faithful and efficient services.

Mr. A. F. Phillips seconded the motion.

Mr. Joseph Cash remarked that there were no criticisms to be made of the report and the accounts. They were excellent, and reflected the greatest credit on all concerned. One of the most singular facts in connection with the working was the remarkable increase shown as compared with other gas companies of which he was aware. There were very few companies that for the past half year showed an increase; and those that did mostly exhibited increases limited to 1, 2, or 3 per cent. That the Harrow Company had obtained such a large increase under the circumstances was proof of the great stability of the Company and of the growth of the district. He congratulated the Engineer on the excellent figures he had shown. His oil consumption of 2 35 gallons per 1000 cubic feet was very creditable; and it was a figure that would be very difficult to beat. Another thing he (Mr. Cash) noticed was that Mr. Chapman's fuel account was a record—14½ per cent. He did not think anybody else had obtained so low a figure yet.

The motion was unanimously agreed to.

Proposed by the Chairman and seconded by Mr. Horace J. Rydon, dividends were declared at the rates per annum of 10½ per cent. on the original capital, of £7 7s. per cent. on the additional "C" capital, and of 7 per cent. per annum on the additional "B" capital and guaranteed shares—all less income-tax.

The Chairman proposed that the Board be empowered to place to the credit of the reserve fund £317 5s., which was the undivided sum they could deal with under the sliding-scale owing to the reduction of the price.

Mr. James Randall seconded the motion; and it was unanimously carried.

Mr. A. F. Phillips, in proposing a vote of thanks to the Engineer and Secretary, the staff, and the workmen generally, remarked that it would be readily understood that with a Company growing as theirs was doing, and with such a developing district, extra exertion on the part of the Manager and continual extension of works were always being called for. Mr. Chapman had had great difficulty in acquiring the land recently bought; and now he was involved in difficulties in getting some of the footpaths upon it diverted. When this task was completed, he had to carry out further extensions of the works. These continued extensions involved the Company in large additions to capital. If any proprietors took the trouble to work out the costs in proportion to the increased sale, they might appear somewhat high; but he must remind them that all these extensions were being carried out on a scale to meet future increases. It was hoped, therefore, that, when the extensions were completed, they would not have to be continually making large additions to the capital account.

Mr. A. W. Oke seconded the motion, which was carried.

Mr. Chapman, in his reply, acknowledged the loyal support that he received from his assistants and the whole of the employees. Regarding general matters, he mentioned that the largest increases in business were being experienced in the parts of their district lying nearest to London. Touching this point, he stated that in 1903 the staff gave him a walking-stick (which he much prized) in commemoration of the fact that, in that year, the Company reached a make of 100 million cubic feet. They were practically certain this year—only six years since that event—of making 200 million cubic feet, which meant a doubling of the business in this comparatively short period.

An Extraordinary Meeting was then held, at which, on the motion of the Chairman, seconded by Mr. A. F. Phillips, a resolution was passed authorizing the Directors to issue a further £33,000 of additional capital and to borrow, by the creation of debenture stock, £11,000 in respect of such additional capital.

Moved by Mr. F. Lennard, and seconded by Mr. F. R. Smith, a hearty vote of thanks was passed to the Chairman and Directors.

PROVINCIAL GAS COMPANIES.

A Small Decrease in Consumption at Dover.

In the report which was submitted to the half-yearly meeting of the Dover Gas Company on Monday of last week, the Directors stated that they had had to meet a claim by the Inland Revenue Authorities for income-tax on amounts written off their slot-meter installation account for depreciation in former years. Consequently the net profits for the six months to June 30 were not quite sufficient to provide the full statutory dividend. The Board, however, recommended the declaration of a dividend for the half year on the stock and shares at the usual rate of 7½ per cent. per annum. This would necessitate the withdrawal of the sum of £121 only from the accumulated surplus profits of past years. They had again succeeded in securing a reduction in price in their contracts for the supply of coal for the ensuing twelve months; and they hoped this would result in the profits for the whole year being sufficient to cover the dividend for the same period. The Chairman (Mr. Willsher Mannering) said the result of the working must be considered satisfactory. Though they had to meet a charge of £200 for income-tax, the profit was within £121 of the sum required for dividend. This amount would be drawn from accumulated surplus profits of former years, and would leave the substantial balance of £4567 to be carried forward. In the previous half year, the profits exceeded the dividend by upwards of £200; so that the trading for the year ending June last had resulted in the dividends being earned and £100 being added to the surplus profit balance. With reference to the revenue account, as compared with the corresponding period of last year, the receipts from gas were down £471. This was owing to the regrettable decrease of 3 per cent. in the consumption. Unfortunately, they were still suffering from trade depression and the large number of empty houses in the town. There was also a small decrease in meter and stove rentals of £8, and a falling off in the returns from residuals of £234. The make of gas was a little less, and prices had been rather lower. Thus there was a total decreased revenue of £713. This decrease, however, had been more than counterbalanced by reduced expenditure. There was a saving of £1324 on coal. The quantity used was less by 236 tons; but the chief difference was owing to the reduced cost of 2s. 2½d. per ton. Purification, salaries, and wages, were £69 less. On the other hand, repairs and maintenance of works cost £248 more. This was due to the payment of the balance of the cost of the renewal of the roof of the coal-store. Distribution charges on the whole were £213 less. Rates and taxes were £47 more; and other items made a total decreased expenditure of £1278. The balance carried forward to the profit and loss was £4272, as compared with £3707, or an increase of £565. After payment of income-tax, interest on loans, and placing £250 to the suspense account, there was an increased net profit of £366. With cheaper coal and nothing unforeseen, the Board anticipated that the profits would be sufficient for the dividends for the ensuing twelve months. The success of the concern in a great measure depended on the efforts of the staff; and it was gratifying to bear testimony to the efficient way in which the work had been carried on in all departments by the united action of the officers and the workmen, who were desirous of doing all they could to promote the prosperity of the undertaking. The report was adopted, the dividend recommended was declared, and the Chairman and Directors, Resident Engineer (Mr. R. Herring), Joint Secretaries (Messrs. G. and E. C. Fielding), and the staff generally were thanked for their services.

Hastings Gas Company and the Corporation.

Dr. G. G. Gray, J.P., the Chairman, in moving the adoption of the report and accounts at the half-yearly meeting of the Hastings and St. Leonards Gas Company last Thursday, pointed out that the principal feature of the past six months' working, as shown by the balance-sheet, was that though there was a reduction in the price of gas of 2d. per 1000 cubic feet as from the commencement of the year, which carried with it the right to increase the dividend, and though this additional dividend had to be met, yet the profit had been such as was sufficient to pay all the interest and dividend as in the past, and also the additional dividend. The profit for the half year amounted to £12,812, or in round figures an increase of £1000. Naturally, those who had considered the matter would have conceived that this had not been accomplished by an increase in the receipts, seeing that they had to sell their commodity at a reduced price, though, as a fact, they had sold more gas than in the corresponding half year. The increase in the amount of gas sold amounted to 1½ million cubic feet; and really, he should say, it was equal to 3 million cubic feet, because in the last half year they had one day less—it being leap year—as compared with the corresponding half of last year. In comparison with the affairs of similar companies, the report could not be considered unsatisfactory. Their good position was due to the reduction in the expenditure, and to economy in the working. The principal item was that of coals, &c., which showed a saving of £2015. This was anticipated. But it was not in anticipation of it that the Directors thought they saw their way to reduce the price of gas; and it was satisfactory to them to see that the opinion they then formed had been confirmed by the half-year's working. The saving of coal was to some considerable extent discounted by the condition of the coke market. While on the question of coal, he would draw their attention to the position they were in as regarded carbonization. Their carbonizing results were the best on record. The report on carbonizing during the month of August, too, was one of the best they had had. The report showed that they had made over 11,800 cubic feet per ton of coal; and though this was the best they ever had, he might say that for some time past they had sold

800 cubic feet per ton more than they used to, so that they got from their coal an increased amount of gas, while they were also carbonizing at less expense. The next item on which a considerable saving had been effected was repairs; the net saving being no less a sum than £1694. The chief item of expenditure which showed an increase was rates and taxes; the increased amount being £211. Taking this and sundry other items into consideration, there was a net decrease of £287, so that the total net decrease in expenditure for the half year amounted to £3785. From the sale of gas there was a net decrease in the amount received of £1315. Residuals showed a decrease of £1538, due to the low price of coke, and to some extent to the fact that rather less coke was sold. Sundry items showed a net increase of £21; so that the total decrease in the receipts amounted to £2832, which, when deducted from the total decrease in expenditure of £3785, left an increased profit of £953. The rates had been increasing. This was a thing they did not like; but it was no use grumbling at it. For some time, however, they as a Company had complained at what they considered anything but fair, straightforward terms, because they had to compete with the Corporation in the sale of another commodity and illuminant. While competition was fair, they did not grumble; but when that commodity was sold, as it had been sold, at less than cost price, so that there had been a deficiency, and this deficiency had been thrown upon the rates, the Company, as one of the largest ratepayers of the town, had been called upon to pay for this other illuminant, which they had not used themselves. Then they said it was not fair trading. They knew it was done by virtue of a Provisional Order obtained long ago; and if the Corporation had to go to Parliament, they would find that this would soon be altered. They had complained, but it was not much use complaining; and the time came when the Corporation were not satisfied, and did what they (the Company) considered was grossly unfair. They overstepped the line, and did what was even illegal. The Company thought the time had come when they were bound to protest, and not only protest, but take action; and they got the illegal amount struck out of the rate. It was true that other items were substituted (which, rightly or wrongly, had been omitted from the rate) for this amount which had been struck out; but these amounts having been charged to the rates, the future rates would benefit by not having to be charged with them. But what would eventually become of the amount struck out? For, of course, it should fall upon the undertaking to which the deficiency was due. As to whether it would, or whether a manipulation of the accounts would enable it to be paid indirectly by the ratepayers, they did not know. Possibly they might never know. This was not fair competition; but unfortunately they had to deal with it, and they had successfully taken proceedings. Probably all those present had seen the illuminations that had been carried out on the Palace Pier by the Gas Company. So general had been the testimony to the good effect, that he would say nothing on the point; but he would like to remark that the Gas Company carried out the work at half the price required by the Corporation to do it. This would show what could be done by gas by way of illuminant, and also what could be accomplished from an economic standpoint. The report was adopted; and the full statutory sliding-scale dividends were declared, at the rates of 6½ per cent. per annum on the 5 per cent. converted stock, 5 per cent. on the 3½ per cent. converted stock, and £6 1s. on the 5 per cent. additional stock. A vote of thanks to the Chairman, the Directors, the Engineer and General Manager (Mr. Charles E. Botley), and the staff concluded the meeting.

A Satisfactory Half Year at Lewes.

The report which was adopted at the half-yearly meeting of the Lewes Gas Company last Wednesday stated that the revenue account showed a profit for the six months to June 30 of £2109. After providing for interest on mortgages, the balance of net revenue as shown in the profit and loss account was £4045. The Directors recommended dividends for the half year at the rate of 5 per cent. upon the original capital stock and 3½ per cent. on the additional capital stock. These dividends, after the deduction of income-tax, would amount to £1403. The Chairman (Mr. M. S. Blaker) congratulated the shareholders upon a successful half year. He said the receipts from gas were satisfactory. The amount was not quite so large as in the corresponding half of the previous year; but in making a comparison between the two periods, it must be remembered that last year the price was 3s. 10d. per 1000 cubic feet, while for one quarter of the past half year it was 3s. 8d. Considering the reduction of 2d. for one quarter, the small diminution of less than £20 in the total receipts was a matter for congratulation. There was an increased output of gas of 368,000 cubic feet last half year, as compared with the corresponding half of 1908. There had been an increase of 37 in the number of consumers, including both ordinary and prepayment meters. The increase of the latter was remarkable. Perhaps the most satisfactory part of the accounts was to be found on the payments' side, especially in the manufacture of gas. Of course, the sum paid for coal was not so much as last year, the price having been less; but the other items—payment for purifying materials, wages and gratuities, and general repairs—all showed a decrease, and the Manager (Mr. Edward Jones) was to be congratulated upon having effected a reduction in the payments under these heads. The receipts for residuals had not been equal to those during the corresponding half; and he was afraid he could not hold out any hope that in the current six months their value would be larger. The usual dividends were recommended; and they would be paid out of the earnings of the Company during the half year, and not, as had sometimes been the case, by drawing to an extent upon the reserve. They were very fortunate in their officers. The Secretary (Mr. H. J. Hillman) was connected with the Company by an hereditary tie, his father having been Secretary before him; while in Mr. Jones they had a Manager in whom they felt the greatest confidence.

Waterford and Profit Sharing.

Presiding at the annual meeting of the Waterford Gas Company, Mr. George Lynch remarked that the report of the year's working was a favourable one. The works were maintained in good condition; but they had before them this year the re-building of the engine-house, and the renewing of engines and exhausters. For the advantage of the workmen, the Directors had assisted them to establish a social club, where they could read or otherwise amuse themselves after work. The club was largely used. The men had asked for, and the Board had consented to introduce, a profit-sharing system; and they expected it to be in operation before the end of the year. The tide, he was glad to say, had turned in favour of gas, as compared with electricity or any other illuminant. A dividend at the rate of 6½ per cent. was declared.

OTTOMAN GAS COMPANY, LIMITED.

Turkish Affairs—The Question of Heavy Charges.

The Ordinary General Meeting of this Company was held on Tuesday last, at the London Offices, No. 9, Queen Street Place, E.C.—Colonel James Le Geyt Daniell in the chair.

The Secretary (Mr. Thomas Guyatt) read the notice convening the meeting; and the report (which was noticed in last week's "Journal," p. 651) and the statement of accounts were taken as read.

The Chairman, in moving the adoption of the report and accounts, remarked that he had no doubt the shareholders would expect some expression of opinion from him with regard to the effect of the revolution that had lately taken place in Turkey upon the affairs of the Company. Speaking of Smyrna, they had enjoyed the great advantage of a Manager there who was able to keep his head cool and himself calm during periods of considerable excitement—sometimes not unattended by fear of damage. He did not think that what had happened had had much effect upon the affairs of the Company in Smyrna; but, of course, when old people were turned out and new people were put in, it always took a little time to settle down to the change. He might mention that the Directors had availed themselves of the presence of Sir Edwin Pears in England to take him into their counsels. He was a gentleman of great ability and experience, and had lived in Turkey for thirty or forty years or more. There was no man who knew Turkish affairs better than he did, and being in Constantinople he could see things as they occurred. He (the Chairman) was quite sure Sir Edwin would not leave a stone unturned in looking after the interests of the Company. Sir Edwin had impressed the Directors very much with the opinion which he (the Chairman) had held ever since his visit to Turkey—that Smyrna had an enormous future before it. From its position and everything else, it was one of the most important places, and would be one of the most important ports in Turkey, Sir Edwin seemed to think; and it was to be hoped that he was correct in this idea. When looking at the accounts, the shareholders must remember that they were made up to June 30, and imagine that they were meeting on July 1. Things had, of course, altered since June 30. The debentures, for instance, were paid off the very next day. As to the various items in the accounts, in sundry creditors there was a small increase as compared with the corresponding period of last year; but it was all easily accounted for. The Imperial Ottoman Government figured for £1032; and he supposed the only change in Smyrna was that money was rather more difficult to get perhaps than was the case previously. This, however, would right itself in time. On the other side of the balance-sheet, fixed plant stood at the same amount as on Dec. 31. Of the addition of £2930 under sundry debtors (as compared with the first half of 1908) gas consumers alone accounted for £1724, and public lighting for about £700. Stocks showed a decrease of £1435. Investments were sold to meet the debentures which, as he had already mentioned, were paid off. Turning to the revenue account coals cost £6273; but they used 400 tons odd more. The average price worked out at 18s. 7½d. per ton, against 19s. 2d. in the corresponding six months. A question was asked him a year ago about the local coal; and he would anticipate it on the present occasion. It might be satisfactory for the shareholders to learn that the contract for Durham coal for the year to June 30, 1910, was 2s. 2½d. per ton less than this year. The contract for Turkish coal for the same period was also entirely satisfactory. In addition to this, the Directors had an opportunity of which they availed themselves, of making a further contract to June 30, 1911, at 1s. 3d. per ton less than the 1910 contract. The quantity of gas made was 6,483,000 cubic feet more than in the same period of 1908; and the make per ton was 10,685 cubic feet. Salaries and lamp lighting together were more; but the shareholders would have been prepared for this at the last meeting, when mention was made of a very ugly looking strike which had broken out in Smyrna. So far as their Company were concerned, he was glad to say that the strike was averted; the matter being most admirably handled by their Manager out there, who showed immense tact and firmness. The Company's men stuck to their employment, and performed their work cheerfully, as they were still doing. Taking the credit side, while the item of products and sundries remained the same as in the corresponding half year, the gas-rental had increased by £1850, the whole of which had been contributed by private lighting. The balance of profit was £4203. Having given this brief account of the Directors' stewardship to the end of June, he ventured to congratulate the proprietors on the strong and sound position of the Company. They had now redeemed the whole of their debentures. Whatever in years gone by might have been the relative proportion that their output of gas bore to the expenditure, they had gradually, during recent years, brought the make of gas in relation to the capital expenditure to a position which—without giving any figures—he might say many companies even in England would be glad to be able to boast of. The Company had done their best to give satisfaction to all customers, whether private or public. The Directors were determined that Smyrna should be provided with the best possible light they could give it.

Mr. Stephenson R. Clarke seconded the motion; and it was at once carried.

On the proposition of the Chairman, seconded by Mr. H. Ward Andrews, dividends for the half year were declared at the rate of 7 per cent. per annum on the preference shares, less income-tax, and at the rate of 8 per cent. per annum on the ordinary shares, tax free.

The Chairman proposed a vote of thanks to Mr. John Gandon, the Engineer (whom he was pleased to see present at the meeting), and the staff in Smyrna, and also to the Secretary. He said he had already

mentioned how much the Company were indebted to Mr. Gandon; and they all knew what they owed to Mr. Guyatt.

Mr. A. M. Paddon, in seconding, remarked that everything indicated that Turkey must develop very much in the future; but if this development was to be attended by constant changes and disturbances, it must be plain to the proprietors that they owed much to the officers who were able to maintain the position and prosperity of the Company.

Mr. J. Tysoe, in supporting the vote, said he was pleased to hear that the finances and general condition of the Company were so very first rate; and he firmly believed that they were on the right road for continued success. There was one suggestion he would like to make to the Engineer. Mr. Gandon no doubt knew well that matters with regard to carbonization were moving in a certain direction, and that results had been attained which would have a very great effect on gas undertakings generally. He spoke of the introduction of twelve-hour charges—a question with which Mr. Gandon was probably fully acquainted. He (Mr. Tysoe) had himself had considerable experience of the matter. In the large works he controlled, they worked this system; and it had proved very satisfactory. The results were certainly much different from what he thought they would be. He, in common with many others, had believed that the acme of efficient carbonization was small charges burned off quickly. Now, to his surprise —and he believed to the surprise of others—it had been proved conclusively that the proper system was to fill up their retorts with large charges and work them off in twelve hours, instead of six hours as heretofore. By this means, they obtained better coke, and anything from 1000 to 1500 cubic feet more gas per ton of coal. It might be possible to do this in Smyrna; and he suggested that experiments should be made.

The vote having been heartily carried,

Mr. Gandon, in acknowledgment, said the vote was most encouraging to him and to the staff. At the time of the strike in other works in Smyrna, the Company had no difficulty with their men; but they naturally had to raise their wages. With regard to heavy coal charges, they had been working with them for years. At Smyrna, they had 9 feet retorts, and were putting into them 4¾ cwt. for six-hour charges. This, he thought, was quite as good as anyone else did. They obtained from 9000 to 9500 cubic feet of gas per mouthpiece per day. This was with ordinary cheap ground-floor settings. He did not think anything better was being done with regenerative settings.

Mr. Tysoe: It is very good.

Mr. Gandon (continuing) said he thought Asia Minor had a very fine future; and they in Smyrna would do everything they could to have a share in this future.

Mr. Guyatt also briefly returned thanks.

Mr. A. W. Oke, in proposing a vote of thanks to the Chairman and Directors, said the balance-sheet spoke for itself; and the shareholders felt that, with such an excellent Board, ably supported by the officers of the Company, the undertaking would enjoy prosperity in the future, as in the past.

The vote was heartily accorded; and the Chairman acknowledged it.

COLONIAL GAS UNDERTAKINGS.

Reports of the working of the following Colonial gas undertakings for the half year to June 30 have recently come to hand (in addition to those of the Australian Gaslight Company and the Melbourne Metropolitan Gas Company, already noticed in our pages).

The revenue of the Brisbane Gas Company from the sale of gas, &c., during the six months was £27,364; and there was a balance brought forward of £5513, making a total of £32,877. The expenditure on gas manufacture, &c., was £13,564; and £3079 was placed to the reserve fund. The net amount to the credit of the profit and loss account was thus £16,234, out of which the Directors recommended a dividend of 6 per cent., which, with income-tax, would absorb £10,080, and leave a sum of £6154 to be carried forward. During the half year, extensions of mains were made in several localities.

The Maryborough (Queensland) Gas and Coke Company, Limited, brought into the accounts for the past six months a balance of £251. Sales of gas, fittings, &c., during the half year produced £2575, residual products £210, and interest £12. Thus there was a total of £3049, from which had to be deducted the expenditure of £2008, which left a disposable balance of £1041 at the credit of the profit and loss account. The Directors recommended the payment of a dividend for the half year at the rate of 6 per cent. per annum, tax free, which would absorb £773, and leave £268 to be carried forward.

After allowing for reserve and depreciation, the North Shore (Sydney) Gas Company, Limited, realized a net profit on the sale of gas, &c., of £6132, which, added to a balance of £72 brought forward, left an amount of £6204 available. Out of this sum, the Directors recommended a dividend of 4 per cent. for the half year, free of income-tax. This would absorb £6148, and leave £56 to be carried forward.

Inconveniences of Electricity.—A local paper furnishes the information that the electric light at Llandudno "again" failed last Saturday week—shops, theatres, and streets being plunged into darkness just at the very busiest time of the evening. The light went out at the Grand Theatre during the performance of the "Merry Widow;" but fortunately there were gas-lights at hand which it was possible to turn on. There was a second failure less than half-an-hour later.

Chesham Water Supply.—A scheme for extensive improvements at the Chesham Urban District Council Water-Works has been completed. Part of the plant laid down when the works were constructed in 1882 having been the source of considerable trouble, the Council sought expert advice; and a scheme for a new pumping-station, at a cost of £6000, was submitted. This, however, with a later and less expensive proposal, was subsequently rejected on the score of economy. Then a third scheme, prepared by Mr. P. C. Dormer, Engineer to the Council, was accepted; and the work has been carried out under his supervision. The outlay was £1087; and to this have been added certain extras, which will bring the total cost up to £1150.

GAS SUPPLY AT MASTERTON, N.Z.

The report is to hand of the Manager of the Masterton (New Zealand) Borough Council Gas-Works—Mr. James W. Blackman—for the year to March 31 last. In the course of it, allusion is made to the removal of the works to a new site, involving an estimated outlay of about £5000.

The output of gas for the period under review was 25,311,800 cubic feet, as against 21,951,100 cubic feet for the previous year—showing an average rate of increase of 15·3 per cent. The unaccounted-for gas was 1,636,300 cubic feet, equal to 6·64 per cent. The total cash revenue was £8607, and showed an increase of £444 from gas supplied and a decrease of £188 from residuals. The increase in the revenue from gas was considered satisfactory, in view of the fact that the reduction in the price of gas made at the latter end of 1907 represented a loss of £626. The decrease in receipts from residuals and coal was partly on account of the extremely mild winter so far experienced, and partly owing to the fact that practically the whole of the output of tar was sold to the Works Department of the Council at 4d. per gallon.

The gross profit on the manufacturing account amounted to £2066. Interest and sinking fund absorbed £1193; the amount expended on capital account from revenue was £789 13s. 6d.; and after other sums had been met, there was a credit balance in the bank of £786.

In November, 1907, the price of gas was reduced to 10s. per 1000 cubic feet, with a discount of 2s. 11d. per 1000 for lighting, 4s. 2d. per 1000 for cookers, and 4s. 7d. per 1000 for power purposes. There is an intermediate discount of 3s. 4d. per 1000 allowed where boiling-rings, grillers, or gas-fires are used. In view of the fact that during the coming financial year the gas undertaking will have to find the interest and sinking fund charges for the amount of £1440 owing to the loan expenditure on the new works account, Mr. Blackman does not recommend any further reduction in price until such time as the new plant is in working order, and the saving in the manufacturing cost thereby effected is available for the payment of the additional interest charges.

AN ACCIDENT AT KILMARNOCK GAS-WORKS.

Board of Trade Report.

Last May an explosion occurred in connection with a cast-iron stop-valve chest at the Kilmarnock Gas-Works, by which the works foreman was somewhat severely scalded. An inquiry into the circumstances attending the accident was duly held, on behalf of the Board of Trade, by Mr. James Cormack, whose report has now been issued. He states that the explosion took place while the stop-valve was being opened in order to connect up one of the boilers, which had been laid off for a few days; and it appears to have been caused by a "water-hammer" shock, which the chest was unable to withstand.

The body and cover of the stop valve chest were of cast iron; while the spindle, valve, and seat were of brass. The bore of the valve-seat and the branches of the chest was 3 inches. The thickness of the body of the cast-iron chest was fairly regular, and measured ⅜-inch at the thinnest part disclosed by the fracture. The chest was fitted about eight or nine years ago. The valve was ground-up and made steam-tight by one of the fitters employed at the gas-works about twelve months prior to the explosion. The boiler plant consists of two Cornish boilers, which are used to supply steam to the engines which drive the scrubbers and the exhausters of the gas plant; and they are also available to supply steam for heating purposes and for driving the pumps of the ammonia recovery plant. The steam-pipes are arranged so that the boilers may be used either together or singly for each of the purposes mentioned; and the stop-valve, the chest of which was fractured by the explosion, was part of the arrangement whereby one of the boilers "A" could be shut off. The maximum working pressure of this, the older of the two boilers, is 50 lbs. per square inch; and it is mainly used to supply steam to the engines in connection with the gas plant—the engine-house being situated about 80 feet from the boiler-house. The safety-valve of the newer boiler "B," which was installed about nine years ago, is adjusted to blow at a pressure of 80 lbs. per square inch; this higher pressure being found necessary to provide against the condensation in the range of pipes between the boiler-house and the ammonia plant—there being a total length of about 160 feet of pipe in this range. Throughout the whole of the steam-pipe system there are no drain-cocks fitted, except those on the cylinders of the engines and pumps. The major portions of both ranges of steam-pipes have a slight droop towards the boilers.

The evidence was to the effect that for a few days prior to the date of the accident, boiler "A" had been shut down for repairs, and boiler "B" had been used to supply steam to the gas plant machinery. The ammonia plant, not being in operation every day, had meanwhile been standing idle. The stop-valve upon the crown of boiler "A," and the stop-valve, the chest of which was fractured by the explosion, were both shut. The fire was kindled in boiler "A" on the day of the accident, and steam was raised to a pressure of about 30 lbs. per square inch, when the foreman and the stoker on duty proceeded to connect the boiler up by opening the stop-valves; the pressure in boiler "B" at that time being about 40 lbs. per square inch. The stop-valve on the crown of boiler "A" was slowly opened by the stoker; and the foreman was in the act of slowly opening the valve which exploded. He had merely moved the wheel slightly, when, after a slight "click," the upper part of the chest blew off.

There is, says Mr. Cormack, a considerable length of pipe, between the stop-valve which was fractured and the common range of pipes, which would, from its conformation, rapidly fill up and remain full of the water of condensation, if the valve in question were closed, and steam passed into the range of pipes leading to the machinery of the gas plant from boiler "B." These appear to have been the circumstances at the time of the explosion; the easing of the stop-valve which fractured and the higher pressure in boiler "B" being sufficient to put the body of water which had collected in the connecting pipe

violently in motion—thus creating the phenomenon commonly known as "water-hammer," which has been the cause of many explosions from steam-pipes and their connecting stop-valves. A drain-cock has now been fitted to this length of pipe, with a view to preventing a similar occurrence in the future.

The Engineer Surveyor-in-Chief (Mr. A. Boyle) makes the following observations upon the inquiry: "The explosion, as clearly pointed out in the report, was the result of a shock of water-hammer. There appears to have been no provision made for the draining of the steam-pipes; and the conditions at the time of the explosion were extremely favourable to water-hammer occurring. If dangerous water-hammer shocks are to be prevented, it is essential that drains should be provided at the parts of the range where water can lodge; but even when these are provided, the greatest care is necessary in the connecting-up of a boiler that has been out of use to a range of pipes which are in open communication with another boiler under working conditions."

TREATMENT OF ROADS WITH TAR.

Experience in Buckinghamshire.

When dealing with the question of tar macadam, in the course of his annual report, Mr. R. J. Thomas, the County Surveyor of Buckinghamshire, makes the following remarks.

Much has been said as to the desirability of laying tarred macadam in various forms upon all main roads; but it is as well to discuss the probable initial cost. In this county, about one-sixth of the metalled area of main roads is coated annually; and 75 per cent. of the entire expenditure over the whole area is incurred in this work. Upon these proportions (metalling one-sixth the area annually, at 75 per cent. of the entire expenditure over the whole area of main roads), the expenditure throughout England and Wales in 1906-7 on the purchase and consolidation of metalling was £1,901,550, out of the total of £2,535,399. Tar macadam cannot be estimated at less than 2s. per square yard, one stone thick, laid complete; and taking one-sixth the metalled area of main roads in England and Wales at about 50,679,200 square yards, its coating in tarred macadam means an outlay of £5,067,920—*i.e.*, £3,166,370 annually in excess of the present expenditure in metalling—representing an additional rate throughout the country of 7½d. The additional annual cost on Buckinghamshire main roads would be £43,700, or equal to a 10d. rate. These figures show that, however desirable, necessary, and ultimately economical it will be to use tar macadam, it is utterly impracticable to make its use general, unless an additional annual sum exceeding £3,000,000 is provided for two or three years to enable road authorities to substitute this material to such an extent as will show a substantial saving in wear, and so reduce the extra cost of laying tar macadam on the remaining portions of roads. It is obvious, therefore, that to make the large majority of country main roads sufficiently strong to withstand the disintegrating effects of modern traffic, more economical and less heroic methods will have to be adopted; the employment of tarred macadam being restricted to the trunk roads most used by all classes of traffic.

Where traffic is heavy and continuous, it is found that tarred macadam loses its bituminous surface or veneer rapidly after the second year, with the result that attrition of the metalling takes place, and dust is created almost as rapidly as on untarred roads. Provision must, therefore, be made for surface tarring such roads in alternate years, if the dust question is of supreme importance. The work practicable with present funds would be that of strengthening weak foundations, the substitution of the hardest materials for local flints and gravel, and their consolidation to a surface impervious to moisture and capable of withstanding all traffic. In Buckinghamshire and adjoining counties, this importation of best materials obtainable is a matter of very considerable cost; the difference between the price of local stone and Shropshire or Leicestershire basalts and granite being very marked, owing to the heavy carriage rates for the latter.

During the year, some 46 miles of rural main roads much used by motors were tar-painted. After many experiments during the past seven years, including tarring 18 inches wide along motor-wheel tracks—which for some inexplicable reason motors frequently avoided subsequently—it was found that the minimum width necessary for keeping granite surfaces down was 9 to 10 feet along the centre; and though it is obvious that to tar the entire area would be preferable, this width was followed at a cost of £15 to £16 per mile, in order to spread the funds available over as great a length as possible. The work was done with a number of 50 to 80 gallon portable boilers, having a perforated pipe-distributor at the back; repeated hand-brushing with bass brooms being resorted to in order to secure penetration of hot tar by absorption into the fabric of the road, and the avoidance of all puddles and inequalities on the surface. This method has proved entirely effective; and in no instance has the granite so treated failed to withstand a summer's traffic. That much of the tar remains in the twelve months' wear, is evidenced by the smaller quantity required for re-painting and by the longer period necessary for completely drying the surface. That a granite road, when tar painted, has at least 20 per cent. longer life where much used by fast motors, is unquestionable.

The cost per square yard—two-thirds of a penny—compares very favourably with that of machine work, which, though under pressure, cannot in one operation secure due penetration, even where jets discharge directly over the openings between stones, neither is the distribution so even as that secured by repeatedly brushing over by hand. Where sharp turns and bends occur on roads much used by motors, it has been expedient to tar the entire width, in order to counteract the disturbing effects of centrifugal skid.

Taking the Bucks price of two-thirds of a penny per square yard, it would cost £704,500 to tar the entire area of rural main roads in England and Wales, or £391,500 to do 10 feet along the centre. Urban main roads would cost £140,000 to tar entirely, and £77,800 for a 10-foot width. This gives a total for all main roads of £844,500 for the whole area, and £469,300 for 10 feet along the centre; and on an assessable value of nearly 9¾ millions, represents a 2d. and 1½d. rate respectively. In the first method, there would probably be a saving of 50 per cent. in cleansing, mud removal, &c., representing £104,000, and 25 per cent. (£52,000) in the latter; bringing the net increase in annual cost to about £740,500 and £417,300—rates of 1¾d. and 1d. respectively.

As already indicated, it is found necessary to tar paint tarred macadam roads after the second year, in order to prevent disturbance of material; so in any comparisons made between surface painting of macadam consolidated in the usual way and tarred macadam, it must be borne in mind that each requires tar painting—the former annually, the latter in alternate years.

A considerable quantity of tar has been used during the past summer in effecting repairs; the method generally adopted being to excavate the metalling to a depth of 2 inches over the entire area of a hole or depression, tar-paint its surface, and well pack and ram into same clean granite, slightly sprinkled with chippings or grit. On roads very much used by motors, granite tarred beforehand has had to be employed; care being necessary to ram until a dense, solid body is attained, capable of withstanding steel-studded tyres.

A SHOP LIGHTING EXPERIENCE AT HYDE.

There is keen competition between the Stalybridge, Hyde, &c., Tramways and Electricity Board and the Hyde Gas Company, in which competition the former take an unfair attitude in seeking to gain advantages. One of their methods has been to supply electricity at prices that have not produced sufficient revenue to enable the Board to meet their obligations; another has been the advertising in the tram-cars of the fallacious statement that electricity is cheaper than gas.

The Hyde Gas Company have in consequence to use the best available means to refute the misleading advertisements. Among their circulars is one which asks: "Which is Cheaper—Gas or Electricity?" and it gives the actual results of the cost of a week's lighting by gas at a shop in Market Street as follows:

Cost for Gas.—The shop is fitted up with 20 "Graetzin" incandescent gas-lamps, the lighting power of which the makers claim to be 120-candle power each, equalling a total of 2400-candle power. Number of hours lighted during the week, ten. Gas consumed, as registered on the meter, 1000 cubic feet, which, at 2s. 9d., less 7½ per cent. discount, amounts to about 2s. 6½d., or (say) 3d. per hour for 2400-candle power of light.

Cost for Electricity.—It would take 48 "Tantalum" incandescent electric lamps, representing, according to the makers, 50-candle power each, to give an equivalent amount of light—viz., 2400-candle power; and as the Tantalum lamps would consume 85 watts per hour each, the quantity of electricity used would be 40·8 units, which, at 3½d. per unit, would cost 11s. 11d., as against 2s. 6½d., being an extra cost of 9s. 4½d., or over four times the cost of lighting by gas.

There are many similar instances in the town; and to these practical experiences the electricians can make no answer.

POSITION OF THE LARGE GAS-ENGINE.

[From the "Manchester Guardian."]

Looked at from almost any point of view, it must be admitted that the position of the large gas-engine in Great Britain to-day is unsatisfactory. With the small gas-engine we do not propose to deal, except in so far as it throws useful light on the position of the large one. It would, perhaps, be difficult to give a comprehensive and acceptable definition as to what constitutes a large gas-engine; but we fancy most engineers are sufficiently agreed to render definition unnecessary. Large-cylinder cotton-mill engines, blast-furnace blowing-engines, and engines for large rolling-mills and electric generating stations would generally be accepted as within any reasonable definition. There are about five British firms engaged or prepared to engage in the manufacture of the large gas-engine; but in each case the engine is of Continental design. It is true that Messrs. Crossley Bros. have made a few engines with moderately large cylinders, and a fair number of multiple-cylinder engines of medium power; but such engines scarcely come within the term "large gas-engines" as ordinarily understood. Several other firms have, indeed, developed the multiple-cylinder engine; and the British Westinghouse Company have made at least one of 1000 H.P. and several not much smaller; but the greatest power developed in one cylinder is only about 125 B.H.P. Hence, though the Westinghouse Company have achieved considerable success with these engines, it cannot be said that they have really done much towards solving the problem of the big gas-engine. It is, for instance, a very long distance in engineering between an eight-cylinder engine of 1000 H.P. and any practical engine of 5000 H.P. or 10,000 H.P.

The development of the large gas-engine in Germany and Belgium has been continuous and fairly rapid. In the United States, the advance made in the last four or five years has been remarkable, and worthy of American traditions. Five years ago, gas-engines of any but the smallest size were almost unknown in the States. To-day it is estimated that the large gas-engines made or building total from 400,000 H.P. to 500,000 H.P.; and some three years ago the Snow Steam-Pump Company, of Buffalo, built some gas-engines for San Francisco of no less than 4000 H.P. It is sometimes advanced in explanation of the more rapid development in Germany that the engines there run mainly on blast-furnace gas, and also on coke-oven gas. The difference in the blast-furnace output of Great Britain and Germany is, however, only about 20 per cent. in Germany's favour; and it is not unreasonable to assume that the power which might be obtained from blast-furnace and coke-oven gases is proportional to the pig iron smelted. Hence it cannot be admitted that the extensive utilization of blast-furnace gas in Germany is any explanation of the slow progress

made by the large gas-engine here. It is quite true that the makers will have to face the problem of running their engines on producer gas, as some of them do now. Indeed, the fact that there is a great future for the large engine using producer gas is one very strong reason why British firms should not be so ready to copy German designs and so disinclined to do any of the necessary pioneer work themselves.

Of the five British firms building the large-cylinder gas-engine, Messrs. Richardson, Westgarth, and Co., Limited, make the Cockerill engine, Messrs. Beardmore the Oechelhaeuser, Messrs. Galloway the Ehrhardt and Sehmer, the Lilleshall Company the Nurnberg, and Messrs. Mather and Platt, Limited, the Körting engine. It is true that Messrs. Mather and Platt have so remodelled the Körting engine that, while retaining the distinctive features of the two-cycle engine, it is virtually a new design, and it is probable that no small part of their success with gas-engines is due to this fact. By reason of the alterations made, the engine is, we understand, much lighter and cheaper to build, and is certainly appreciably simpler in construction—a feature which appeals more strongly to English engineers than to Germans. English firms contemplating the manufacture of big gas-engines have usually advertised for an engineer with experience of such engines. That almost invariably means a German or a Belgian engineer with experience mainly, if not solely, with engines working upon blast-furnace gas. Such a man naturally tends to rely upon his Continental experience; whereas it is found in practice that extensive alterations and adaptations to suit English ideas and conditions are necessary. In such circumstances, the engineer's previous experience may easily prove partly a hindrance.

The fact must be faced that a good deal of development work will have to be done by British firms before the large gas-engine is firmly established; and the qualities in the engineer which make most for success in these circumstances are courage, logic, and invention, tempered by a good knowledge of engineering conditions and reasonable caution. Experience is useful, but it requires even more care in its application to a new design than the inventive faculty; for whereas a new idea is sure to be sharply criticized and probably pronounced impossible or dangerous by half the staff and most of the foremen, an old method applied to meet new conditions will as often as not be accepted without question. An engineer who relies upon experience tends to repeat himself; and the whole idea of development work is to climb away from this repetition. A good deal depends upon the principals of the firm; and to them the large gas-engine presents a nice problem in estimating the relative advantages of buying Continental designs which will probably require alteration, and burden the engines with a heavy royalty, or of getting a young man of brains and ability, and setting him to work to learn by every legitimate means all that can be known on the subject, and afterwards building up their own design. The first method has so far produced wonderfully poor results from the commercial as well as from the technical point of view.

As regards the technical part, it is being realized that it is not sufficient to buy drawings. It is quite true that design has a good deal to do with success; but material and workmanship, especially as they relate to cylinder casting, have also a good deal of influence. A defect which is largely technical, though also partly commercial, is that cost is too high. This, indeed, is the primary defect; and it cannot be too strongly emphasized that reduction of cost is the direction in which progress must be made. Such progress will probably depend as much upon the makers of producer and similar plant as upon the engine builders. Some figures recently collected bearing upon this point showed that there is wide divergence among makers as to prices; and that is rather a hopeful sign for the future. On the commercial side, the chief difficulty is lack of courage, especially on the part of engine builders. Firms already established in the gas-engine business seem to be too well pleased with their trade in engines of medium size. Certainly they have shown a decided disinclination to tackle the large cylinder engine; and this has discouraged everybody. The remarkable advance of the steam turbine has been another retarding factor; but the chief has been lack of initiative and boldness.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Aberdeen Corporation gas accounts, which were referred to in these "Notes" last week, were submitted to the Town Council on Monday by Mr. W. A. Stewart, the Convener of the Gas Committee, who, in moving their adoption, said that the expenditure during the year in producing gas was close on £100,000; while the income from sales was about £123,000—leaving a net revenue or profit of £22,753. The question the Council had to decide was what they were to do. The Committee proposed that £9000 should be set aside for paying interest, annuities, and insurance; and of the balance they recommended that £10,000 should be put aside for the sinking fund, and that £3000 be paid to renewal account. After putting aside all this, they had still a balance on hand of £612, to which fell to be added the previous year's balance, which allowed them to carry to the current year's account a sum of £3400. The Committee felt that they had dealt very liberally with the sinking fund and the renewal account, and they thought that the consumer was entitled to some consideration also. He was glad that the Committee were able to recommend a reduction in the price of gas from 2s. 7d. to 2s. 6d. per 1000 cubic feet, and that the charge to those using gas for motive power be reduced to 2s. 3d.; and also that those who had prepayment meters should get 29 cubic feet instead of 26 for 1d. During the past year the progress made at the gas-works had been great. The number of cubic feet of gas produced was 730 million cubic feet—an increase of 12 millions over the previous year. Their progress had not only been in respect of lighting, but also in regard to the number of stoves used. These had increased by 410; and they had now 3872 stoves out on hire. These stoves led to the use of a large amount of gas, and helped to lower the price to the ordinary lighting consumer. Not only this, but he thought it would solve the domestic servant problem to a great extent. There

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 682.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17¾—18¼	..	5 9 7
298,955	10	,,	7	Do. 7 p.c.	12¾—13¼	+¼	5 5 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd.	5⅝—5⅞	..	5 10 8
40,000	5	,,	6½	Do. New, £4 paid	4½—4¾	..	5 9 6
50,000	10	Aug. 26	15	Bournemouth Gas and Water 10 p.c.	28—28½	..	5 5 3
311,810	10	,,	7	Do. B 7 p.c.	16¼—16¾	..	4 3 7
75,000	10	,,	6	Do. Pref. 6 p.c.	15⅜—15⅝	..	3 16 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	251—254	+1	4 18 5
300,000	,,	,,	9½	Do. New	190—192	..	4 19 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
206,250	,,	June 11	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
220,000	Stk.	Sep. 10	11	Brighton & Hove Orig.	208—213*	+2	5 3 3
246,320	,,	,,	8	Do. A Ord. Stk.	150—152*	..	5 5 3
460,000	20	Apl. 16	10	British	43—43½	..	4 11 11
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c.	117—119	..	5 0 10
165,700	,,	,,	4½	Do. B 3½ p.c.	88—90	..	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c.	106—108	..	5 1 10
55,000	,,	June 25	3½	Do. 3½ p.c. Deb.	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13¾—14¼	..	4 18 3
250,000	Stk.	June 25	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157 150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	106½—108½	..	4 12 2
1,493,280	Stk.	Aug. 26	$5\frac{2}{10}$	Commercial 4 p.c. Stk.	108—110	+1	4 14 7
560,000	,,	,,	5	Do. 3½ p.c. do.	103—105	..	4 15 3
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	95—97	..	5 3 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
492,270	Stk.	—	5	Derby Con. Stk.	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord.	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd.	24½—25	..	4 16 0
354,060	10	,,	12	Do. £7 10s. paid.	18½—19	..	4 14 9
15,141,545	Stk.	Aug. 12	4⅔	Gas light and Coke 4 p.c. Ord.	104½—105½	+½	4 8 5
2,600,000	,,	,,	3½	Do. 3½ p.c. max.	87—89	..	3 18 8
3,799,735	,,	,,	4	Do. 4 p.c. Con. Pref.	103—105	..	3 16 2
4,193,975	,,	June 11	3	Do. 3 p.c. Con. Deb.	86—87	..	3 8 11
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	91—93*	+½	5 7 6
82,500	,,	,,	6½	Do. do. 5 p.c.	116—118*	+1¼	5 10 2
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17¾—18¼	..	6 0 7
131,000	Stk.	Sep. 10	6½	Ilford A and C	138—140*	..	4 12 10
65,780	,,	,,	5	Do. B	104—106*	+½	4 14 4
65,500	,,	June 25	4	Do. 4 p.c. Deb.	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental	179—181	..	4 8 5
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 11

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c.	118—120	..	5 0 0
561,000	Stk.	,,	10	Liverpool United A.	223-225	..	4 8 11
718,100	,,	,,	7	Do. B	165—167	+½	4 3 10
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean.	4⅞—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met of Melbourne 5 p.c. Deb.	102—105	+1½	4 15 2
250,000	100	,,	4½	Do. 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 27	3½	Monte Video, Ltd.	12¾—13¼	+¼	5 5 8
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con	106½—107½	..	4 3 9
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	92—93	..	3 12 2
55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	139—141	..	5 13 6
60,000	5	Sep. 10	8	Ottoman, Ltd.	5⅞—6⅛*	..	6 1 0
31,800	53	Aug. 26	13	Portsea Island A.	137—139	..	4 19 0
60,000	50	,,	13	Do. B.	129—131	..	4 19 3
100,000	50	,,	12	Do. C.	120—123	..	4 17 7
114,800	50	,,	10	Do. D and E.	101—103	..	4 17 1
398,490	5	May 13	7	Primitiva Ord.	7—7¼	+⅛	4 16 8
796,980	5	July 29	5	Do. 5 p.c Pref.	5¼—5½	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
1,000,000	10	Apl. 29	8	River Plate Ord.	16¾—17¼	..	4 12 9
312,650	Stk.	June 25	4	Do. 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd.	14¼—14¾	..	5 8 6
62,500	10	,,	6	Do. 6 p.c. Pref.	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb.	49½—50½	..	4 19 0
135,000	Stk.	Mar. 12	10	Sheffield A	231—233	..	4 5 10
209,984	,,	,,	10	Do. B	231—233	..	4 5 10
523,500	,,	,,	10	Do. C	231—233	..	4 5 10
70,000	10	June 11	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Aug. 12	5⅓	South Met., 4 p.c. Ord.	119—121	..	4 8 1
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	85—86	..	3 9 9
209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	153—155	..	5 3 3
605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	118—120	..	4 11 8
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord.	110—112	..	4 9 3
120,000	Stk.	Aug. 12	6⅞	Tottenham and Edmonton A 5 p.c.	132—134	..	5 2 7
453,940	,,	,,	5⅝	Do. B 3½ p.c.	110—112	..	4 15 11
149,470	,,	June 25	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109—111	..	4 10 1
255,636	Stk.	Aug. 26	6⅝	Wandsworth B 3½ p.c.	138—140	..	4 14 8
79,416	,,	June 25	3	Do. 3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	,,	Aug. 12	5⅜	West Ham 5 p.c. Ord.	124—126	..	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref.	127—129	..	3 17 6
253,300	,,	June 25	4	Do. 4 p.c. Deb Stk.	112—114	..	3 10 2

Prices marked * are "Ex div."

was no doubt also that gas-stoves were of great assistance to the wives of working men, who were now able to do their work with less trouble than before; and now that they had reduced the price of gas, the Committee expected that they would have a further development in the use of gas-stoves. While the Committee were gratified that there had been such a large increase in the consumption of gas, the gratification would be more complete if they were sure that the ordinary consumer was getting full lighting value for the amount consumed. Now that incandescent mantles had been so reduced in price, they hoped that people would adopt these burners, by which they would get twice as much light, and their gas bill would be reduced by from 20 to 30 per cent. The Committee desired that the public should get full value, and, with this end in view, they had been showing a number of incandescent lamps in their Union Street depôt. He had to ask the Council to acknowledge the services of the officials at the gas-works. They moved there very quietly, but they moved well, and everything at the gas-works was well done. Mr. Milne, the Manager, devoted an amount of time, energy, and activity to the work that, he was sure, no other official in the service of the Council equalled. Mr. Kendall Burnett, in seconding the approval of the accounts, said that Mr. Stewart's statement was an excellent one, and reflected credit on the Convener, who was deserving of the best thanks of the Council. The accounts were adopted. A further recommendation of the Gas Committee was also adopted, to the effect that discounts be allowed to consumers settling their half-yearly accounts not later than Jan. 20 and June 20, at the following rates per 1000 cubic feet: Where the consumption is over 35,000 and under 50,000 feet, 1d.; over 50,000, 2d.; over 500,000, 3d.; over, 1,000,000, 4d.; over 2,000,000, 5d.; 4,000,000 cubic feet and upwards, 6d.

The valuation of Aberdeen has been made up at £867,371—which is a reduction of £4509 upon last year. There is a reduction upon the value of the Corporation gas-works of £4545, which accounts for more than the total decline in the valuation.

The story told by Mr. A. C. Young, the Engineer and Manager to the Arbroath Gas Corporation, at the ceremony of the inauguration of the new gasholder there on Thursday—a report of which appears elsewhere—is quite a romance in gas management. We have all known that since he went to Arbroath, a little over seven years ago, Mr. Young has been actively engaged in the reconstruction of the gas-works, and that he has been more than ordinarily successful in his management; but it will probably surprise most people to learn that practically the whole plant in the works had been renewed, and, more wonderful, that until this year, when £6000 or £7000—the cost of the new holder and new water-cooled condensers—has been placed to suspense account, all the outlays for renewals have been taken from revenue. They have practically a new gas-works without a capital account. The suspense account is expected to be wiped out in about three years. After that the Corporation will be free to apply themselves to a reduction of the capital sum standing against the works before the process of renewal began. This was a work which was not persevered in before. Beginning with 1871, when the transfer took place, the capital debt, including the capitalized value of annuities, mounted up to £77,737; and of this sum, only £11,000 odd has been redeemed. The conclusion seems inevitable that if the Corporation are able now to apply over £2000 a year in the reduction of indebtedness, they surely must have been somewhat remiss in that duty in former days. Most probably the right conclusion is that, for the ability to do what the Corporation are now doing, we must look to the management. Mr. Young has certainly inspired the confidence in him of the Corporation and of the community as well. The results he has been able to attain to are sufficient to justify the confidence reposed in him; and it is impossible to conceive of him looking upon the proceedings last Thursday in any other light than that of a triumph for the policy of management he has pursued. I, at any rate, must accord him that honour, and do it most heartily, for the unbroken advance he has made towards the position in which the Corporation gas-works now are. The new gasholder, which is his design, is a shapely structure, and to all appearance it merits all that was said of it.

In the Dumfries Town Council last week, the Gas Committee made several recommendations of more than usual importance. They recommended, among other matters, that £1500 be placed to the reserve fund out of the profits for the past year; that the Managers—Messrs. J. Smith and S. Dickie—be requested to prepare a report, with plans, upon the subject of a new retort-house and coal-store, retort-bench, and machinery for charging and discharging retorts, &c., to be submitted to an early meeting; that a deputation of their number be appointed to visit, along with the Managers, a number of gas-works in Scotland with a view to obtaining information which might be useful in the matter of improved retort-house and coal-storage accommodation and other matters; that plant for the distilling of tar be erected at a probable cost, as estimated by the Managers, of £200; that the prices of gas be reduced by 1d. per 1000 cubic feet, making them to ordinary consumers and for public lighting 2s. 10d., to prepayment meter consumers 3s. 4d., and for motive power 2s. 7d.; and that the same discounts be allowed as last year, subject to any change which may be agreed to by the Council after a report upon the subject by the Managers has been received and considered. All the recommendations were unanimously adopted.

In the Inverkeithing Town Council last week, a letter from the Secretary of the Inverkeithing Gas Company was read, in which it was stated that the Directors believed that the Town Council were not disposed to purchase the gas-works. They had been considering the necessity for enlarging the works; and he had been instructed to ask if the Council would be willing to grant a feu of a piece of vacant ground at Saltpans. The intention meantime was to place a gasholder there; but the idea was to have new works erected when the wants of the burgh demanded it. Mr. Craig asked if the Council could not erect works themselves at that place. The Town Clerk gave the ruling that he was afraid they could not without first adopting the Act, which they could not do without buying up the Company. Mr. Craig thought that, if the Company's proposal were serious, the Council should consider the question of buying up the undertaking. For every £100 the Company might spend now, the Council would have to pay

£300 or £400 later on. The Company were not only considering the needs of the burgh, but were anticipating the requirements of Rosyth Naval Base. The Town Clerk said that at present the Company could not get the full use of their retorts, owing to the insufficiency of their present holder. The Council agreed to consider the subject in Committee. The Company is a very small concern, having only an annual output of 2 million cubic feet, and a capital of £1100; but, with the naval works in progress in the neighbourhood, there are certainly great possibilities.

The section of the inhabitants of Crossgates who were opposed to the lighting of the place being given to the Cowdenbeath Gas Company have written to the Dunfermline District Committee stating that they have presented their case in detail to the powers that rule in London, and to the Local Government Board, and pointing out that no power had been given to the Cowdenbeath Company to supply gas. It was also complained that the specifications which were approved of had not been carried out. There were to be forty street-lamps; while only 25 new and seven old ones were being fixed. This was considered neither honourable nor creditable to the gentlemen who composed the Council. Mr. R. W. Wallace, who presided at the meeting of the District Committee, said that their procedure had been quite regular. They received two offers. One was withdrawn; and fearing lest there had been some misunderstanding, they asked for fresh offers. One offer was received; and as it seemed reasonable, the District Committee approved of it, and remitted the arrangement of the details to the Local Committee. Some of the members of the Committee did not attend, and for this the District Committee were not responsible. When they had done their best to meet the circumstances of the case, he did not see that there was very much to complain of. The Committee approved of the action which had been taken.

The thirty-fifth annual meeting of the Nairn Gaslight Company, Limited, was held last week—Mr. J. Gordon, Chairman, presiding. The net profit for the year was £592. A dividend of 4 per cent. was declared, which absorbs £245. The make of gas during the year was 15,148,700 cubic feet.

The vote of the ratepayers of Carnoustie, taken last Saturday, upon the question of the adoption of the Burghs Gas Supply Act, resulted as follows: For, 555; against, 42—giving a majority in favour of the gas transfer of 513. Provost Walker has expressed his gratification that the ratepayers had backed up the Town Council.

The annual meeting of the St. Andrews Gas Company was held yesterday—Mr. A. Aikman, the Chairman, presiding. The balance-sheet showed the income to have been £9867, and the expenditure £8390; leaving a balance of £1436 available for final dividend. The Chairman, in moving adoption of the report, referred to the continued prosperity of the Company during the year. The Directors had agreed to abolish the rental on cookers, with the result that a large increase in the number of cookers and grills had taken place, and they fully anticipated this would result in increased profits. The Directors' report was adopted, and a dividend of £3 per share was declared.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 11.

Sulphate of Ammonia.

Demand has been well sustained throughout the week, and parcels offered have been readily placed at a further advance in prices. The closing quotations are, consequently, £11 6s. 3d. per ton f.o.b. Hull, £11 7s. 6d. per ton to £11 8s. 9d. per ton f.o.b. Liverpool, and £11 10s. per ton f.o.b. Leith. For delivery up to the end of the year, £11 10s. is about the value. For the first four to six months of next year, £11 15s. per ton is being quoted f.o.b. Leith, but this price has not been paid.

Nitrate of Soda.

The market remains very quiet at 9s. 6d. and 9s. 9d. per cwt. for ordinary and refined qualities respectively.

LONDON, *Sept.* 13.

Tar Products.

The markets have been steady throughout the past week. Pitch is still exceedingly firm, and although prices have not actually advanced, makers are, if anything, firmer in their ideas. In South Wales there is a very good demand for prompt delivery, as well as for delivery to June next; while in some cases they are desirous of purchasing to the end of the year. Continental buyers are also coming more freely into the market. Creosote is exceedingly quiet, and orders are scarce. Benzols are steady; but prices are unchanged. Toluol is firm in the North for this year's delivery. Solvent is in fair demand. Carbolic is weak; and crystals are difficult of sale. Naphthalene is dull; but salts are in fair request. There is no alteration in anthracene.

The average values during the week were: Tar, 15s. 3d. to 19s. 3d. *ex* works. Pitch, London, 30s.; east coast, 29s. 9d. to 30s.; west coast, 28s. 6d. to 29s. 6d. f.a.s. Mersey ports, 28s. 6d. to 29s. f.o.b. others. Benzol, 90 per cent., casks included, London, 6¼d. to 6½d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6¾d. to 7d. Toluol, casks included, London, 9d.; North, 8¾d. to 9d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3¼d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 10½d. to 10¾d.; North, 9¾d. to 10d. Creosote, in bulk, London, 2⅝d. to 2¾d.; North, 2⅛d. to 2⅜d. Heavy oils, in bulk, 2¾d. to 2⅞d. Carbolic acid, 60 per cent., casks included, east coast, 10½d. to 10¾d.; west coast, 10¼d. to 10½d. Naphthalene, £4 10s. to £8 10s.; salts, 35s. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This market has been firm during the past week for prompt and forward delivery. The Gas Companies are quoting £11 10s. for prompt, and £11 12s. 6d., Jan.-June; Beckton, £11 2s. 6d.; London, £11 2s. 6d. The quotations at Hull are £11 5s. to £11 6s. 3d.; Liverpool, £11 6s. 3d. to £11 7s. 6d.; Leith, £11 10s. for prompt, and £11 2s. 6d. Jan.-June—some makers asking £11 15s. for forward.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been some irregularity in the northern coal trade during the last few days; but, on the whole, the tone has been a little firmer. In the steam coal trade, the price is still low to what it was a few weeks ago. Best Northumbrians are from 10s. 7½d. to 11s. 3d. per ton f.o.b.; second-class steams are from 10s.; and steam smalls show a rather better demand, from 5s. to 6s. The output at the collieries is fairly good; but there are occasions when want of ready steamers at the ports has made a day's idleness inevitable. In the gas coal trade, the home demand is improving steadily; and there are heavier deliveries now on the long contracts, as well as fair exports. The quotation for Durham gas coals is from 10s. to 11s. 1½d. per ton f.o.b., according to quality, for the usual classes; and up to 11s. 7½d. for "Wear specials." More gas coals are now being sold for export to Italy, including two lots of about 50,000 tons each for delivery over next year. One of these, for second-class gas coals, sold for about 10s. 1½d. per ton f.o.b.; and the other, for best sorts, commanded very close to 11s. per ton f.o.b.—the possibilities of the Eight Hours Act having influence. Coke is firm, and gas coke unaltered. The latter is in heavier supply, with prices ranging from 12s. to 12s. 9d. per ton f.o.b.

Scotch Coal Trade.

Business is quiet at home, and the shipping trade is falling off. Prices are not unaffected; and the prospect is that they will come still lower, though it may not be very much. The quotations now are: Ell 8s. 9d. to 10s. 3d., splint 10s. 3d. to 10s. 6d., and steam, 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 295,458 tons—a decrease of 68,740 tons upon the previous week, and 36,484 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,184,594 tons—an increase of 618,706 tons upon the corresponding period.

Suction-Gas Plant for the Rosyth Naval Works.—Messrs. Easton Gibb and Son, the Contractors for the naval works at Rosyth, have decided to erect a private central power station for the distribution of electric light and power throughout the entire works at Rosyth naval base; and an order has been given for the installation of four gas-engines and suction-gas plants with a maximum output of 1100 B.H.P. The engines are to run day and night continuously, supplying electric current at 500 to 550 volts to the various motors spread over this large area—the work to be done including quarrying, stone crushing, concrete mixing, the driving of machine shops and sawmills, pumping, &c. The suction-gas plants are to use gas coke for fuel, costing about 10s. per ton; and it is estimated that electricity will be obtained at a total cost of ⅜d. per Board of Trade unit, including all standing and working charges.

Camborne Water Company's New Works.—In taking the chair at the half-yearly meeting of the Camborne Water Company, Mr. W. C. Pendarves referred to the difficulty which had been experienced, owing partly to dry weather, in supplying the outlying portions of the district. The demand was very heavy at Camborne; and undoubtedly the supply at Illogan had been very short. The Directors hoped that the new works which were being carried out would remove all cause of complaint. There was a good deal of waste of water, which it was difficult to stop. The works which were being undertaken at Boswyn had been satisfactorily accomplished; and the new reservoir was likely to increase the supply of water. The revenue for the half year (£1880) was £127 more than in any corresponding period; but, on the other hand, the expenditure was more by £157, owing to the large amount of pumping required. It was decided to pay dividends of 8 per cent. on the "A" shares and £5 12s. per cent. on the "B" shares, which would absorb £724 of the revenue of £902, and leave £178 to be carried forward. At an extraordinary meeting which followed, the Directors were empowered to raise £8333 by the issue of debentures; this being one-third of the additional capital authorized by the Company's new Act.

Falmouth Water Supply.—A discussion took place at the meeting of the Falmouth Town Council last Thursday respecting the water supply. Mr. Fox, on behalf of the Water Committee, expressed the opinion that they were getting as good a supply as they could expect. The Water Company were doing as much as was possible without buying fresh land to increase the storage. When the works now in progress were completed, the storage would be very much larger. In the meantime, if there was a continuance of dry weather, consumers would have to be careful, or it would be necessary to further curtail the supply. There were complaints of a great deal of waste. Mr. H. S. Johns said the officials of the Water Company told them that the quantity of water used per head was greater in Falmouth than in most towns. It was hoped that, with the additional provision for storage, and an average rainfall during the winter, it would not be necessary to curtail the supply in future to the same extent as in the past. A letter was read from the Company pointing out that, in spite of the very dry winter and summer, the water had not been cut off in the daytime; and the only sufferers of inconvenience from the curtailment had been persons who had neglected to fit storage tanks on their premises. Owing to the reckless waste of water and carelessness on the part of the consumers, the consumption was very much above the average of other towns. At no time since the great drought of 1887 had the domestic supply been curtailed during the daytime; and this, added the letter, was not a bad record for any Company. The Mayor (Mr. F. J. Bowles), who is Manager of the Water Company, said the drought this year was very exceptional; and it was a matter for congratulation that the supply had not been curtailed during the day. Mr. Harris expressed the fear that the reputation of Falmouth would suffer in regard to its water supply. Mr. Fox said much of the difficulty was due to the dry weather. The Water Committee were agreeably surprised at what the Company had been doing.

Plymouth Water-Works Accounts.—The Borough Treasurer of Plymouth submitted to the Finance Committee at their last meeting a statement of accounts for the year ending March 31. This showed that on revenue account the income was £32,481, of which £18,712 was from water-rentals and £12,622 from sales of water by meter. The expenditure was £10,735; the chief items being wages £3151; rates, taxes, &c., £4158; works and maintenance, £2547; and establishment expenses, £582. The gross profit for the year was £21,745; and after allowing £10,012 for dividends and interest, £5269 for stock and mortgages redemption, and £997 for repayment of loans, there was a balance of £5467, which was the net profit. On capital account, there was an expenditure of £8842; the greater part of this (£6945) being for the duplication of a portion of the trunk main supplying the town.

Cheaper Gas for High Wycombe.—The Directors of the High Wycombe Gaslight and Coke Company, Limited, state in their report for the half year to June 30 that they feel justified in recommending a reduction of 2d. per 1000 cubic feet in the price of gas, as from Oct. 1 (making the rate 4s., with the usual discounts for prompt payment), and an increase in the dividend to 9 per cent. per annum on the ordinary capital and £6 6s. per cent. on the additional capital. After payment of interest on debentures, and providing for the preference dividend, there remains a sum of £2540 available for distribution; and when the increased dividends alluded to have been paid, there will be a balance of £1714 to carry forward. The Manager (Mr. Harold Baker) has received tangible proof of the satisfaction of both Directors and shareholders with his efforts on behalf of the undertaking.

Droitwich Mainlayer's Death.—Somewhat curious circumstances surrounded the death of Edward Price (aged 47), who was formerly in the employ of the Droitwich Corporation Gas Department. From the evidence tendered at the inquest, it appeared that, as long ago as last November, deceased was engaged with a man named Harrison (who died not very long after the accident) in tapping a gas-main, when both men were overcome. Price was removed unconscious, but was not attended by a doctor; and subsequently he returned to work. Three months ago, however, he became very ill, and got gradually worse until he died. Mr. F. Shewring, the Manager, said that Price returned to work the morning after the accident. The foreman (Harrison) was supplied with bladders; but the use of them was left to his discretion. The doctor who attended deceased stated that there was some valvular trouble of the heart, quick pulse, difficulty in breathing, great emaciation, and partial paralysis of the lower extremities. He formed the opinion that at the time of the accident the heart and lungs were damaged by the temporary suffocation. The lungs since the accident had taken up oxygen insufficiently; and the diminished supply of oxygen would act much as a diminished supply of food, causing the emaciation. The heart strain at the time of the accident would give rise to valvular mischief. Slight effusion into the spinal canal would cause the partial paralysis in the lower extremities. He was of the opinion that death was the result of the accident. There was no other disease. The Jury found that deceased died from the results of suffocation by gas.

A Low Price at Plymouth.—The Plymouth and Stonehouse Gas Company give notice of a reduction of 1d. per 1000 cubic feet in the price of gas, which will then be 1s. 9d. per 1000 cubic feet.

Reduction in Price at Teignmouth.—At a meeting last Tuesday, the Teignmouth Urban District Council adopted a recommendation of the Gas Committee that the price of gas be reduced to 3s. 3d. per 1000 cubic feet as from June 30 last, and that a proportionate reduction be made in the charge for public lighting.

Paignton Water-Works Contract.—Subject to its ratification by the District Council, an agreement has been reached in the dispute respecting the Contractors' claim for the execution of the Paignton water-works scheme. The Contractors (Messrs. Hawkings and Best originally claimed the sum of £130,941; but this was reduced to £86,101. The Council paid during the progress of the works £46,341; and Messrs. Hawkings and Best claimed £39,760 as the balance due to them. Mr. Vanstone, as Arbitrator, took evidence for and against the claim. Last week there was a conference at the offices of the Contractors' Solicitors, at which it was agreed that Messrs. Hawkings and Best should receive £10,000 in full settlement of their claim. This sum is to include £4000 retention money held by the Council. Each party will pay its own costs of the arbitration.

The Board of the James Keith and Blackman Company, Limited, recommend a dividend for the year of 5½ per cent. on the preference shares—carrying forward £2301.

At Mossley it has been resolved, on the recommendation of the Manager (Mr. J. Taylor), to arrange for the cleaning and regulating of consumers' gas fires and stoves throughout the district at a charge of 6d. each.

The Bland Light Syndicate, of No. 29, Little Trinity Lane, E.C., are issuing a fresh catalogue which, besides containing illustrated particulars and prices of their well-known burner, gives some attractive new designs of inexpensive and artistic gas-fittings and glassware, together with details of incandescent accessories, slot-fittings, and general gas-works appliances.

Mittons Fittings, Limited, is the title of a Company registered with a capital of £1500, in £1 shares, to acquire a patent relating to suspension fittings for inverted gas-burners, to adopt an agreement with D. Mitton, and to carry on the business of manufacturers of, and dealers in, fittings used in connection with inverted gas-burners and electric lamps of the incandescent type, &c.

The Thames Conservators have issued a circular to District Councils calling their attention to discharges of an objectionable character from surface-water drains. The Conservators state that they are advised that the increasing use of oily and tarry substances for dust prevention will prove detrimental to the river and subsidiary streams; and they request the Councils to take precautions accordingly.

The models of the "St. Andrew" gas-radiator that Messrs. Wright introduced last year, and sent out to some of the most important gas undertakings, met with such favour that this year it has been decided to make them in more considerable numbers, so as to give other gas authorities the means of showing, in a convenient form, the appearance and principles of this well-known apparatus. The models are under 10 inches high; and all the various fittings are shown in the correct position and proportion.

Considerable prominence has been given in the Scottish Press to Lord Reay's address at the opening of the South of Scotland Technical College, Galashiels, last Saturday week. The building is lit throughout with gas; the "Telephos" system of electric ignition having been adopted on the recommendation and to the specification of Mr. Daniel Macfie, of Edinburgh. In this somewhat unique installation, over 150 upright incandescent "Telephos" burners are employed; and the work has, it is said, been satisfactorily carried out by a local firm.

A speciality is made by Messrs. Isaac Eales and Co., of No. 40, Howard Street, Birmingham, of the "Forto" gas-mantles, which are stated to be durable and to possess good lighting qualities. The greatest care is exercised in the manufacture of these mantles; and every one is turned out under the personal supervision of the proprietor. For the forthcoming season's trade, the firm have a complete range of patterns, from the cheap varieties to the more expensive forms for use with high-pressure burners and self-intensifying lamps. They also offer various pattern gas-burners of neat appearance, together with all accessories. Messrs. Eales make a point of the fact that they are the only actual manufacturers of incandescent gas-mantles in Birmingham.

We have received from the Correspondence College Company, of No. 26, Green Street, Cambridge, and Gaywood, Norfolk, a copy of "The Success Book—Kalendar 1909-10." The objects of the Company are stated in the following terms in the course of an introduction: "The College was formed to provide students with correspondence tuition in the practical, as well as theoretical, side of the various branches of engineering technology and commerce. There are many institutions and tutors who provide tuition, but only on the theoretical side. This, however, is not sufficient in this practical age. The practical side must, therefore, be emphasized more than the theoretical. The granting of engineering degrees by the different universities is a proof of this. The London University is the only college granting an engineering degree to external students; and these must, perforce, be prepared by correspondence tuition. This also applies to the surveying, electrical, gas, architectural, and other branches of engineering. To meet this want, our courses were instituted, and an efficient staff of practical engineers engaged to prepare the lectures and notes. Only men with extended practical experience, combined with high honours in theoretical training, were engaged, thus ensuring certain success to the student. The College is entirely devoted to correspondence work; and so giving the student undivided attention—a *sine quâ non* for successful work. It is the intention of the Council to provide laboratories and workshops in the near future, in order that those who have spare time may take up courses of practical work." The book gives particulars of the various examinations, as well as the College's own diploma courses.

APPLICATIONS FOR LETTERS PATENT.

19,794.—Peck, W. W., "Recovering ammonia from crude ammoniacal liquors." Aug. 30.

19,812.—Jones, A. O., "Discharging and conveying away the coked product from vertical coke-ovens or gas-retorts with base discharge." Aug. 30.

19,852.—Spencer, H. J., "Heat radiator for use with gas-burners." Aug. 30.

19,904.—Hamblin, W. E., "Bye-pass burner." Aug. 31.

19,924.—Lumsden, T., "Gas-producers." Aug. 31.

19,935.—Ehrich and Graetz, "Automatic lighting and extinguishing devices for gas-lamps." Aug. 31.

19,941.—Sparks, E., "Clockwork-controlled devices for lighting and extinguishing gas-burners." Aug. 31.

19,949.—Imer, E., "Reflectors with closed globe." Aug. 31.

19,958.—Wolfson, R., "Incandescent burner-fittings." Aug. 31.

19,959.—Koppers, H., "Obtaining bye-products in the dry-distillation or gasification of fuel." Aug. 31.

19,962.—Boult, A. J., "Gas-burners." A communication from F. Yockey and J. H. Jones. Aug. 31.

19,984.—Hansford, J., and Wright, A. C., "Meter attachments." Sept. 1.

19,990.—Leask, H. N., "Treating gases with liquids." Sept. 1.

20,012.—Piper, E. J., "Acetylene generators." Sept. 1.

20,017-8.—Cowper-Coles, S. O., "Reflectors." Sept. 1.

20,019.—Cowper-Coles, S. O., "Lamps or lanterns." Sept. 1.

20,023.—Cowper-Coles, S. O, "Lamps." Sept. 1.

20,031.—Fletcher, E., "Compression of gas or air for lighting or heating purposes." Sept. 1.

20,042.—Davis, H. N., and Twigg, W. R., "Gas-fires." Sept. 1.

20,044.—Wakefield, C. C., "Acetylene generators." Sept. 1.

20,060.—Altmann, F., "Inverted burners." Sept. 1.

20,072.—Graham, J., A., Jun., & D. A., "Fluid-pressure reducing valves." Sept. 2.

20,074.—Gibbs, A., "Gas-stove jacket-boiler." Sept. 2.

20,158.—Tozer, C. W., "Distillation, carbonization, and the like of coal and other carbonaceous material." Sept. 3.

20,187.—Wilson, H., "Gas-fire and fuel." Sept. 3.

20,202.—Szàm, S., "Tube scraper." Sept. 3.

20,237.—Simpson, W. S., "Manufacture and purification of coke." Sept. 3.

20,254.—Moore, W. G., "Retort." Sept. 4.

20,266.—Hoyle, J. C., and Hall, H., "Gas-burners." Sept. 4.

20,292.—Moeller, J., "Heating and lighting by gas." Sept. 4.

20,304.—Fichet, A, and Heurtey, R., "Gas-generators." Sept. 4.

20,309.—Glover, S., and West, J., "Distillation of coal in vertical retorts." Sept. 4.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.
Accountant, &c. Merthyr Tydfil Gas Company.
Chemist. No. 5133.
Commissions (Gas Meter Indexes). No. 5134.
Representative. No. 5131.

Agency Wanted. No. 5135.

Situations Wanted.
Secretary, Manager, or Accountant. No. 5115.
Foreman or Engineer Fitter. No. 5136.

Stocks and Shares.
Brixham Gas Company. Sept. 30.
Portsmouth Water Company. Oct. 20.
Tonbridge Water Company. Oct. 1, 1909.

Meeting.
British Gaslight Company. London Offices, Sept. 29, Twelve o'clock.

TENDERS FOR

Coke.
Bolton Gas Department. Tenders by Sept. 30.
Sheppy Gas Company. Tenders by Sept. 29.
Wandsworth and Putney Gaslight Company. Tenders by Sept. 17.

Cocks (Iron and Brass), Gun Metal, &c.
Glasgow Gas Department. Tenders by Sept. 21.

General Stores (Retort-Mountings, &c., Hot-plates, Brooms, Limestone, Wheels, Rake-Heads, Meter Boards, Tin Pans and Grids, &c.)
Glasgow Gas Department. Tenders by Sept. 21.

Meters.
Glasgow Gas Department. Tenders by Sept. 21.

Pipes, &c.
Glasgow Gas Department. Tenders by Sept. 1.

Purifiers, &c.
Cheltenham Gaslight Company. Tenders by Sept. 22.

Tar.
Blackpool Gas Department. Tenders by Sept 25.
Market Harborough Gas Department. Tenders by Sept. 27.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."
United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in advance.

All Communications, Remittances, &c., to be addressed to Walter King, 11, Bolt Court, Fleet Street, London, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

SHEPPY GAS COMPANY.

THE Directors invite Tenders for the Purchase of the whole of their Surplus COKE (estimated at about 2000 Tons), or for part thereof, which will be produced between the 1st of October, 1909, and the 30th of September, 1910. Rail and Water facilities.

Tenders to be sent in, to the undersigned, not later than Wednesday morning, the 29th inst.

The Directors do not bind themselves to accept the highest or any Tender.

H. BARBER,
Secretary and General Manager.

Gas Offices, 22, Edward Street,
Sheerness, Sept. 2, 1909.

COUNTY BOROUGH OF BLACKPOOL.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the Surplus TAR produced during the next Twelve Months, from Sept. 30, 1909, to Sept. 30, 1910.

Particulars may be had from the undersigned.

Tenders, endorsed, to be sent, addressed to the Chairman, by the 25th inst.

By order,
JOHN CHEW,
Engineer.

Gas Offices, Princess Street,
Blackpool, Sept. 8, 1909.

COKE.

THE Directors of the Wandsworth and Putney Gaslight and Coke Company invite TENDERS for the Removal of about 10,000 Tons of Guaranteed "WANDSWORTH" COKE from their Works at Wandsworth between Oct. 1 next and March 31, 1910.

The Coke to be removed by Van or by Barge (free waterway on River Thames).

Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than the 17th of September.

The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.

Any further Information may be obtained from the Engineer, Mr. H. O. Carr.

CHAS. W. BRAINE,
Secretary.

Wandsworth and Putney Gaslight
and Coke Company,
Fairfield Street, Wandsworth, S.W.
Aug. 25, 1909.

CHELTENHAM GASLIGHT AND COKE COMPANY.

PURIFIERS, &c.

THE Directors invite Tenders for the Supply and Erection of a set of Six Cast-Iron PURIFIERS, 40 ft. by 30 ft. by 6 ft., together with Valves, Connections, Oxide Elevators, &c.

Copies of the Specification and Drawings can be obtained on and after Wednesday, the 1st day of September next, on Payment of One Guinea.

Tenders, addressed to the undersigned, to be delivered on or before Wednesday, the 22nd day of September next.

The Directors do not bind themselves to accept the lowest or any Tender.

R. O. PATERSON,
Engineer and Manager.

Gas-Works, Cheltenham,
Aug. 25, 1909.

CORPORATION OF GLASGOW.
(GAS DEPARTMENT.)

THE Corporation invite Tenders for Supplying the following MATERIALS as may be required by the Gas Department for Twelve Months from date of acceptance—viz.:

1—Birch Brooms.
2—Brass Couplers and Stop Cocks.
3—Cast-Iron Pipes and Special Castings.
4—Cast-Iron Retort Mountings and other Castings.
5—Cast-Iron Screwed Saddles, and Double Faucet Stop Cocks.
6—Corks and Bungs.
7—Gas Hotplates for Kitchen Ranges.
8—Gun-Metal, &c., Castings.
9—Hay.
10—Limestone.
11—Malleable Iron Tube and Fittings.
12—Malleable and Cast Steel Castings, Bogie Wheels, and Rake Heads.
13—Meters, Ordinary and Prepayment.
14—Meter Boards and Wood Rhones.
15—Tin Pans and Grids.

ALSO TENDERS FOR:—

1—Cartage of Ashes, &c., at Provan and Tradeston Gas-Works.
2—Cartage for Street Mains and Workshops Departments.

Specifications and Forms of Tender may be obtained, and Samples Examined, on Application to Mr. Alex. Wilson, Gas Engineer, 45, John Street, Glasgow.

Sealed Tenders, marked outside "Gas Department, Tender for ———," must be lodged with the Subscriber, on or before Tuesday, the 21st of September current.

The lowest or any Tender may not be accepted.

A. W. MYLES,
Town Clerk.

City Chambers, Glasgow,
Sept. 9, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

TONBRIDGE WATER-WORKS COMPANY, LIMITED.

ISSUE OF 100 £5 "C" SHARES BY TENDER.

AS AUTHORIZED BY THE TONBRIDGE WATER-ORDER OF 1900.

THE Directors of the Tonbridge Water-Works, Company, are prepared to receive APPLICATIONS for the above on or before Oct. 1, 1909.

Particulars, with Form of Tender, can be obtained on Application to the Secretary, JAMES LEES, 4, The Terrace, TONBRIDGE.

BRIXHAM GAS COMPANY.

SALE OF 200 7 PER CENT. ADDITIONAL ORDINARY SHARES OF £10 EACH.

MR. S. F. Dugdall is instructed by the Directors to SELL BY AUCTION, at the Town Hall, Brixham, Devon, on Thursday, the 30th of September, 1909, at Six p.m. precisely, in Separate Lots, 200 ADDITIONAL ORDINARY SHARES of £10 each, entitling the Holders to a standard dividend of 7 per Cent. (subject to the Sliding-Scale based on the Price of Gas).

The Standard Price of Gas is 4s. per 1000 Cubic Feet.

The Company was established in 1838 and incorporated by Special Act of Parliament on the 24th of June, 1904, and supplemented by the Brixham Gas and Electricity Act, 1906.

The Capital now being issued is required to meet expenditure in respect of Various Extensions.

Detailed Particulars of Sale obtainable post free from the OFFICES of the Company, Fore Street, BRIXHAM; W. A. SCHULTZ AND Co., Chartered Accountants, 50, Cannon Street, LONDON, E.C.; Mr. W. L. PARSONS, Solicitor, Brixham, DEVON; and the AUCTIONEER, Mr. S. F. DUGDALL, Brixham, DEVON.

Sept. 1, 1909.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

Third Sale under the Company's Act, 1906.

IMPORTANT SALE OF NEW ISSUE OF SHARES IN THIS OLD-ESTABLISHED AND GOOD DIVIDEND-PAYING COMPANY.

KING AND KING beg to announce that they are favoured with Instructions from the Directors of the above-named Company to SELL BY PUBLIC AUCTION, at their Sale Rooms, 46, Commercial Road, Portsmouth, on Wednesday, Oct. 20, 1909, at Seven o'clock in the Evening (in convenient Lots), the Third Portion of a New Issue authorized under "The Borough of Portsmouth Water-Works Act, 1906," consisting of

2000 SHARES OF £5 EACH

(fully paid), forming part of the New Ordinary Capital authorized under such Act.

The Auctioneers desire to call the special attention of Capitalists, Investors, and others to this very favourable opportunity of securing Shares in such a thoroughly sound Local Company.

The Shares will be sold Free of any Charges, Fees, or Expenses whatever to the Purchaser.

Full Particulars and Conditions of Sale may be obtained, with any further Information, from the Secretary of the Company, J. L. WILKINSON, Esq., F.C.I.S., at the Company's Offices, Commercial Road, PORTSMOUTH; or of the AUCTIONEERS, at their Offices, 46, Commercial Road, PORTSMOUTH; 20, Palmerston Road, SOUTHSEA; and "Magdala House," SOUTH HAYLING.

National and Municipal Telephones—No. 12.
Telegraphic Address—"Kings, Portsmouth."

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 29th inst., at Twelve o'clock precisely, to transact the usual Business; to declare a Dividend for the Half Year ended the 30th of June last; to elect two Directors in the place of those who go out by rotation; and to appoint two Auditors.

AND NOTICE IS HEREBY ALSO GIVEN, that at such Meeting a Resolution will be submitted to the Proprietors dealing with the payment by the Company of Income Tax in respect of the Remuneration of the Directors and Auditors.

The TRANSFER BOOKS of the Company WILL BE CLOSED on the 18th inst. and RE-OPENED on the 30th inst.

By order of the Court of Directors,
A. W. BROOKES,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.
Sept. 8, 1909.

"VITERNUS" FOR

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Makers: JOHN E. WILLIAMS & CO., Lower Moss Lane, MANCHESTER, S.W.

"COALEXLD."

Where this Fuel is Manufactured, **the strongest evidence of its advantages** to the Gas Engineering World **is seen by the absence of Stocks of Coke,** as the daily Sales of **Coalexld** clear the Stock as Manufactured.

For further Particulars, apply to—

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QUARTERLY
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PRICE **2s.** *EACH.*

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WILL DISCHARGE A RETORT IN ONE OPERATION

LARGE NUMBERS IN USE.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited.
GLASGOW.

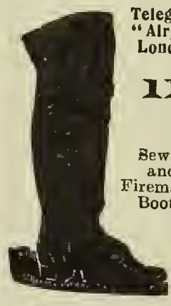
[See Illustrated Advertisement, Aug. 10, p. 420.]

THE WIGAN COAL & IRON CO., LIMTD.,

Are the exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, Wigan, and of the Manton Steam and House Coal Collieries, Worksop, Notts, and supply the well-known Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, House and Steam Coals, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: *6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.*
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone: No. 200.

LONDON DISTRICT OFFICE: *6, STRAND, LONDON—C. PARKER & SON, Sole Agents.* Telegraphic Address: "PARKER, LONDON."



Sewer and Fireman's Boots.

Telegrams: "Airproof, London."

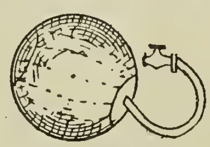
THOMAS BUGDEN & CO.,

Telephone: 743 City.

India-Rubber and Airproof Manufacturers and General Contractors,

116-118, GOSWELL ROAD, LONDON, E.C.

Largest Manufacturers of Gas Main Bags.

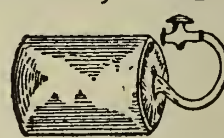


Gas Bags for repairing Mains, All Seams Stitched and Taped.

Patentees of the DENMAR BAG,

Impervious to Main Liquor and Climatic Influences.

Oilskin Clothing, Diving and Wading Dresses, Sewer Boots, Tar Hose, Stokers' Mitts, Bellows, &c.



Gas Bags for repairing Mains. All Seams Stitched and Taped.

Contractors' and Mine Jackets.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE, & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·20.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS SHEFFIELD."

Welsbach
LIGHT
Inverted Arc Lamp, Fig. 623.

Storm Proof—
For Exterior Lighting.

BRITISH MADE.

Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

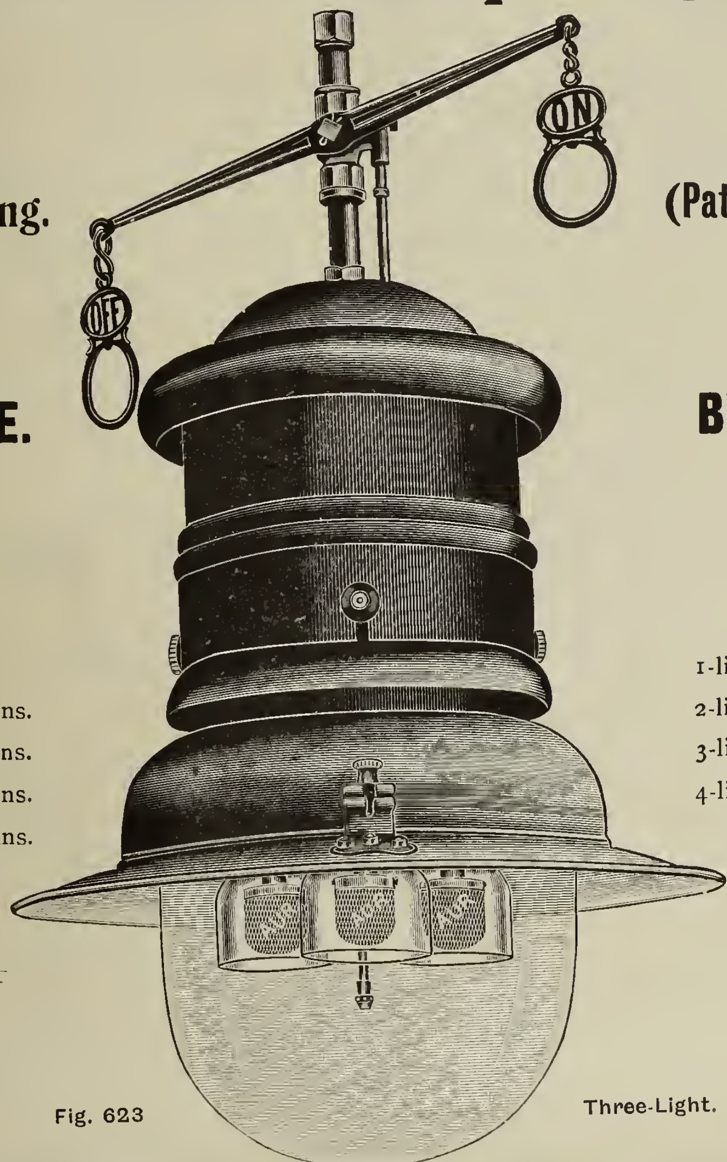


Fig. 623 Three-Light.

Welsbach-Kern
(Patent) Inverted System

BRITISH MADE.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

ENAMELLED Green Steel Casing, fitted with Welsbach-Kern Inverted Burners, Gas and Air Regulators operated from outside. Sliding Door to give access to Burners for cleaning purposes. Fitted with Magnesia Nozzles, Welsbach Mantles, and Glass Mantle Protectors. Complete as shown. Highly efficient and regenerative.

	Gas per hour.	C.P.	Steel.	Copper Case.
1-light	4 feet	125	**30/-**	**5/-** extra.
2-light	8 feet	260	**47/6**	**6/-** extra.
3-light	12 feet	400	**52/6**	**6/-** extra.
4-light	16 feet	550	**72/6**	**9/-** extra.

All on or off, or One light on and the rest off, **7/6** per Lamp extra. Cup and Ball, **3/6** per Lamp extra.

RENEWALS.

Glass Mantle Protectors (Fig. 623) **3/4½** per dozen, or in case lots of 5 gross, **33/-** per gross.

	1-Light.	2-Light.	3-Light.	4-Light.
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

	1-Light.	2-Light.	3-Light.	4-Light
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
Parabolic Reflector, extra "	**3/6**	**6/-**	**7/6**	Not made

Welsbach Mantles, each **6d.** subject as usual.

The Welsbach Mantles for Upright lighting are "C," "CX," and "Plaissetty," price **4½d.** each.

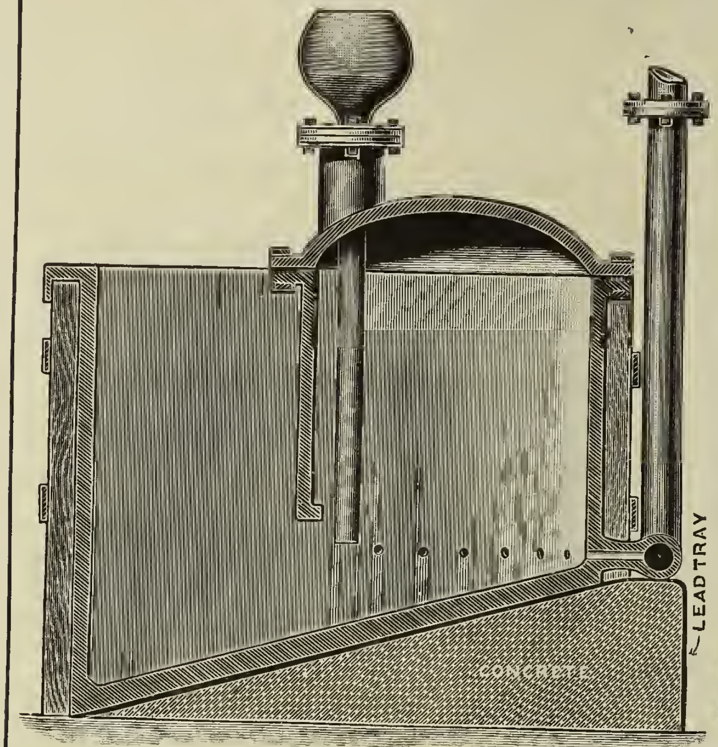
THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,
Welsbach House, 344-354, Gray's Inn Road, London, W.C.

Telegrams and Cables: "WELSBACH LONDON." *Telephone 2410 NORTH.*

BIGGS, WALL & CO.

Telegrams: "RAGOUT LONDON."
Telephone: 273, CENTRAL.

MAKERS OF SULPHATE OF AMMONIA PLANT.



Section showing Williams and Fenner's Patent Outside Cracker Pipe as fitted to our Solid Lead Plate Saturator.

Sole Proprietors of Williams' and Fenner's Patent Saturator with Outside Cracker Pipe, for which we claim the following

ADVANTAGES:—

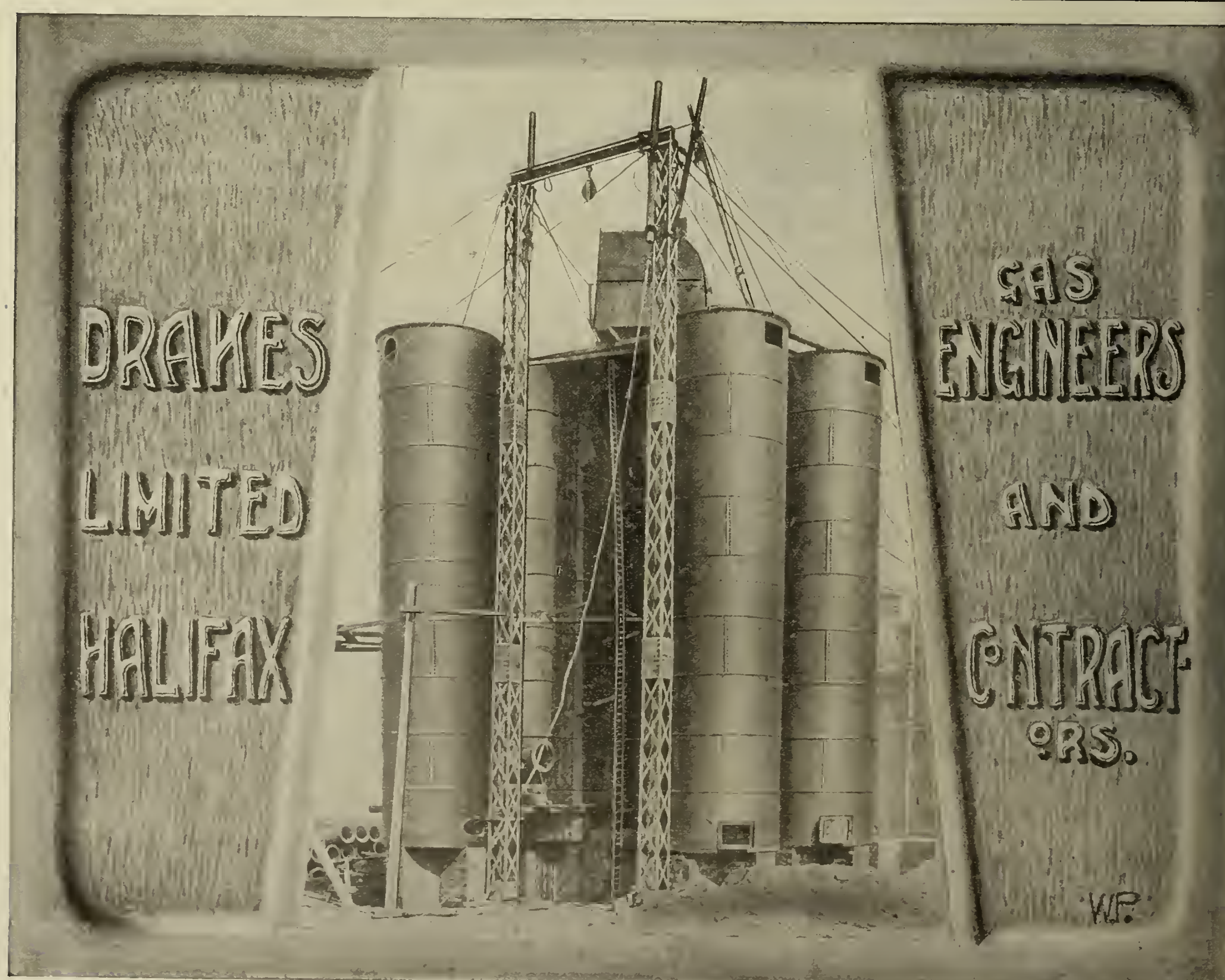
1. Equal distribution of Steam and Ammonia.
2. Perfect agitation and boiling of the Acid Liquor.
3. No possibility of local Alkalinity,
4. Consequently no formation of Blue Salt.
5. Sulphate is easily forced to point of discharge.
6. No incrustation.
7. No renewals of Cracker Pipe.
8. Capacity of output greatly increased.

IT CAN BE APPLIED TO ANY EXISTING SATURATOR.

LICENCES TO MAKE MAY BE OBTAINED; FOR FULL PARTICULARS APPLY TO

BIGGS, WALL & CO.

13, Cross Street, Finsbury Pavement,
LONDON, E.C.



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THE JOURNAL OF GAS LIGHTING WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CVII. No. 2419.] · LONDON, SEPTEMBER 21, 1909. [61ST YEAR. PRICE 6d.

Graetzin-Light

ALWAYS IN FRONT.

The most perfect gas light in the World.

40-60°/o Saving in Gas.

Beware of Imitations. No Graetzin Burner genuine without the Stamp

"GRAETZIN"

LATEST IMPROVEMENTS.

A **scientific special process** has been adopted for the Brass Casing on the **Graetzin-Burner,** so that the **Brass will not change its original colour** as ordinary Lacquered Brass does.

The **Graetzin-Burner** is now supplied with **Ornamental China Casing,** or in **Steel Enamelled,** assorted Art Colours, with Gold Decoration.

There is an improvement in the construction of the Gas Regulating Nipple. **The regulating Screw cannot be entirely removed,** and thus **escape of Gas** has been made **impossible** by this safety device, and a **new improved Air Regulator** has been adopted.

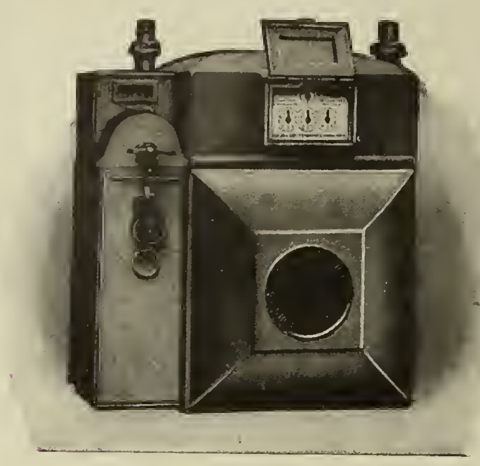
Ask for **Genuine Graetzin Incandescent Mantles** packed in **Patent Boxes** with **Trade Mark,** also **Silvered Glass Graetzin Nosma Reflectors,** increasing light enormously.

Graetzin High-Pressure Light up to **5000-Candle Power** for Street Lighting, Railways, Docks, Factories, Warehouses, &c., can be supplied.

Graetzin Burners, Indoor and Outside Lamps may be obtained from the leading Wholesale Houses in the Trade.

R. LAIDLAW & SON (EDINBURGH), LTD.

GAS METER MAKERS.



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COMPLETE SATISFACTION.

Prepayment Wet Meters in Cast-Iron Cases.

Prepayment Dry Meters in Tinplate Cases.

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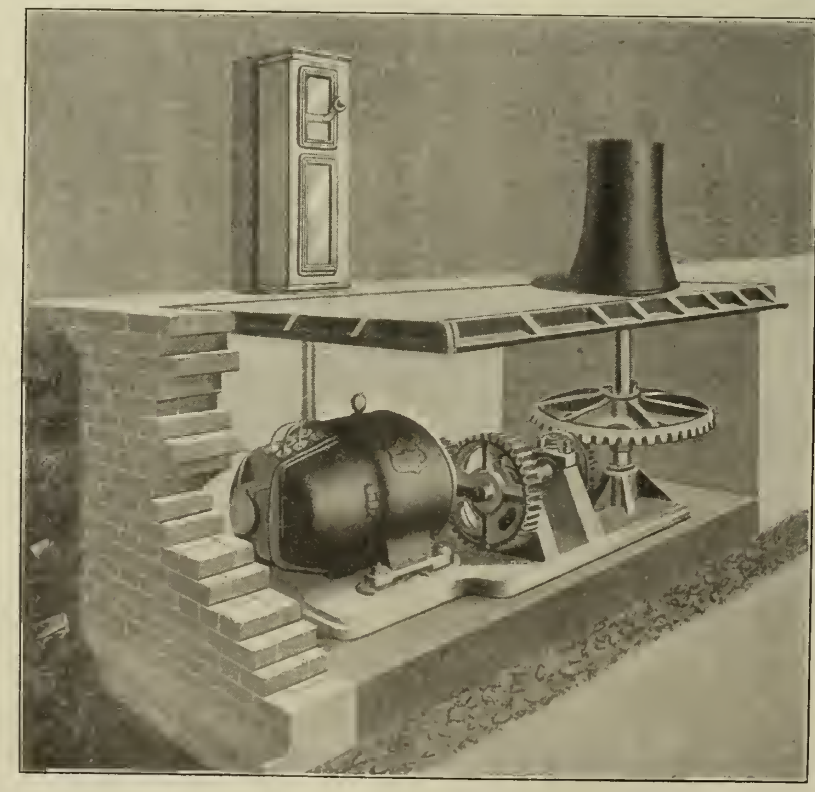
Makers of all kinds of Electric, Hydraulic, and Belt-Driven **CAPSTANS.**

Electric, Hydraulic, and Belt-Driven **WAGGON TIPPERS** and **WAGGON HOISTS.**



Electric Haulage Capstan.

Sole Makers of The D.B. Patent **HOT COKE CONVEYORS,** and Jenkins De Brouwer Patent **STOKING MACHINES,** also Makers of **TELPHER CONVEYING PLANTS,** and all kinds of **GAS-WORKS MACHINERY.**

BEEHIVE WORKS, RETFORD, NOTTS., ENGLAND.

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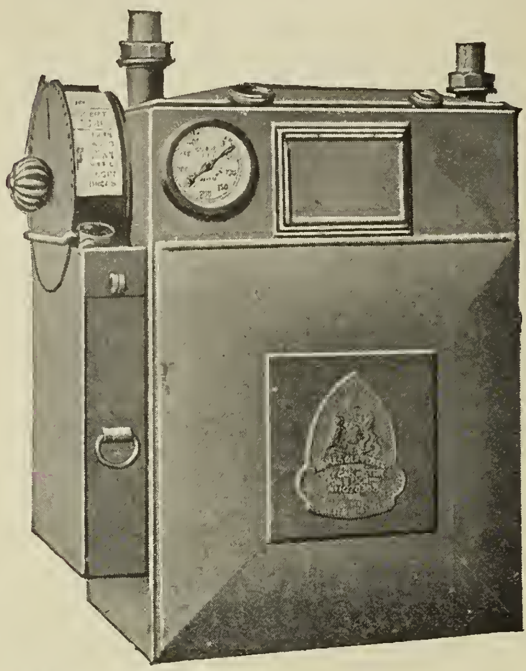


W. PARKINSON & Co
LONDON
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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVII., No. 2419.——TUESDAY, SEPTEMBER 21, 1909.

EDITORIAL NOTES—GAS, &c.

Calorific Power Clauses.

Though the general terms of the calorific power standard and testings to be applied to the Gaslight and Coke Company are widely known in the gas industry, it will be both interesting and useful, this being the first statutory calorific standard with penalties for defects, to publish from the Company's Act the text of the clauses dealing with the matter. This we do in other columns to-day. From the clauses, it will be manifest to our readers that the scheme, so far as the standard and conditions are concerned, excepting the forfeitures, may be regarded as purely tentative. Nevertheless it marks the advent of the statutory testing of gas for its calorific power; and such testing has come to stay—under what circumstances is a matter for the future. However, the standard before us is subject to several conditions; and this betokens a recognition (though the recognition was not obtained without close discussion) that, this being such a complete innovation, the Company, as far as possible, should be protected against the odium of penalty for a relatively small transient lapse from the standard, and beyond there is the reference to the Board of Trade as to a triennial revision of the standard, which will give an opportunity for the discussion of a simplified standard at the end of 1912.

Briefly let us recapitulate the terms of the standard and test. The standard is to be 125 calories (say, 500 B.Th.U.) net; but the Company positively declined to be subject to such a standard for 14-candle gas with a penalty attached. They are therefore not to be mulct so long as the gas is not more than 10 per cent. below the standard—that is to say, so long as it is not below 112½ calories. If the gas on any one day is deficient of calorific power not exceeding 6 calories below the 112½ calories, then, in the Administrative County of London, the average of the tests of that day and the preceding and following days is to be taken; and if the average is not then less than the 112½ calories, the Company will be exempt from forfeiture. In the case of the district occupied by the West Ham Company (which is being taken over by the Gaslight Company), the average of three days' tests, in the event of the gas being not exceeding 6 calories below the 112½ calories, is to be ascertained by taking the results of the two days following, and not the day preceding and the day following, the one on which the deficiency occurred. It seems opposed to common sense that a standard should exist that does not carry a penalty, under conditions; and the whole scheme in this case points to the 125 calories net being an unfair standard, and one not to be entertained without the modifying terms. Virtually, the standard is 112½ calories; the figure above a sort of "false god," and meaningless and without utility. It is early to foretell the future, or to form any judgment as to what will be the experience from Jan. 1 next; but, in the scheme itself, there is to be found sufficient reason for encouraging the belief now that, at the end of three years, steps will be taken to rule out the unserviceable 125 calories. It can be understood that the London County Council—being the London County Council—were tenacious in the matter of the 125 calories, so that they might have a margin in hand in which to endeavour to move up the penalty-line at some future time, if considered expedient; but the whole of the tests that have been taken, for information purposes in London, show the impossibility of proving the expediency or the justice of any such action.

As to forfeitures, the rigorous manner in which gas is tested in London at statutory testing-places governing the whole Metropolitan area, is well known; but the clauses in the Act have ensured that the controlling authority in the Administrative County of London shall only secure a forfeiture in respect of deficiency at one testing-place per day; and that in the West Ham area only one controlling authority shall secure a forfeiture for deficiency on any one day. Subject to the conditions that are outlined above, the forfeitures are to be as follows: For a deficiency not exceeding 3 calories, £5; and exceeding 3 calories but not amounting to 6 calories, a sum not exceeding £10. So far, the penalties in the Administrative County of London and the West Ham area are alike. It will be observed that to keep the penalty for a larger deficiency than 3 calories to within £10, the deficiency must not amount to 6 calories—it must be something under, and not up to, 6 calories. The reason for this is seen in the succeeding provision, to the effect that, in the Administrative County of London, for each *complete* 6 calories of defective power, the forfeiture is to be not less than £25, and not exceeding £100. This is substantial; but it will only apply when the average of three days' testings is down to 106½ calories. For the West Ham district, the corresponding provision is not so onerous, in that the forfeiture for each complete 6 calories of defective power is not to exceed £20. These broadly are the main features of the clauses. There are several minor conditions, which are available to interested readers by the verbatim reproduction in this issue of the clauses from the Act.

Port of London Tax on Coal.

In the draft schedule of dues that the Port of London Authority are proposing to inflict on goods entering London *viâ* the Thames, is included a tax of 6d. upon coal. If there were any chance of this 6d. becoming an actual and permanent tax upon the London and Suburban Gas Companies whose coal is seaborne, it would be a serious matter, as, at the least, it would probably represent, in the areas of the three Metropolitan Gas Companies alone, a charge upon the gas consumers of between £75,000 and £80,000 a year, assuming no increase in the use of coal for gas making. But there is a likelihood of the proposition being considerably modified, as, in their draft schedule, the Port Authority have considerably exceeded, on a liberal computation, the revenue they will require. According to one of our coal contemporaries, the Authority's needs in respect of revenue will be satisfied in the immediate future by £300,000 a year; while on the coal that arrived in London coastwise in 1907, 6d. per ton levy would have represented two-thirds of that sum. For the three London Gas Companies, excluding the Suburban Companies, to alone have to pay one-fourth of the necessary revenue would be monstrous. That, however is what the proposal as it at present stands amounts to; for, excluding the Brentford, Wandsworth, and other Companies who use the Thames for the conveyance of coal, and taking no account of the oil used for gas manufacture, the consumption of coal by the three London Companies, in the year ending June 30 last, was 3,017,120 tons, which at 6d. per ton would represent £75,428.

The schedule of proposed dues has been circulated among those interested in them for their observations; and, at the end of this month, the Board of Trade will be asked to consider and approve the recommendations made. There should not, therefore, be delay in discussing the matter, and submitting objections. When the Port of London Bill was before the Parliamentary Committee, the Gas Companies concerned, for the purpose of obtaining relief, made representations as to the public service they are rendering, the conditions of which public service are controlled by Parliament. But the Companies' submissions were not received by the Committee in any particularly generous or friendly spirit—in fact, there was no adequate consideration of the Companies' case; and they were referred to the Board of Trade. As we understand the position, the Gas Companies do not desire exemption from all contribution to the improvement and maintenance of the Thames and the Port. But they do think their peculiar position as large and regular importers of coal to London for the purpose of the supply of a public necessity should be taken into consideration, although at the same time they recognize that anything in the way of improving and maintaining the Port that will increase the value and amount of the trade of London, will be indirectly to the advantage of their undertakings. But that

advantage would be dearly bought at 6d. per ton upon the material forming the basis of their manufacture. Any impost of this kind must fall upon the consumers; and among the hundreds of thousands of gas consumers in London are numbered the poorest of the poor and those who, for their very life's sake, have to struggle most severely with the harsh conditions of these more than ordinarily harsh times.

Gas-Fire Economics.

The winter months are fast approaching; and the thoughts of those interested in gas supply naturally turn to the applications of gas that are special to the season. As a matter of fact, there is but one application that is not common to other periods of the year, and that is heating for personal comfort and health. Descriptive articles and advertisements in our pages have already borne witness to the steps taken by some of the leading gas-fire manufacturers to meet in the coming winter the demands of the gas supplier and consumer for efficient and attractive fires. These demands are increasing. Year by year now sees a growth of the gas-fire business. Though last winter in its early months had not as a characteristic any great severity of weather, we know that some of the makers of gas-fires had record sales in this department. And this is an effect that must follow improvement and the suppression of the several causes that have hitherto proved obstructive to obtaining for gas-fires the same rapid popularity as in the case of (say) gas cooking-stoves. Gas-fires have been cheapened; their appearance has been improved. For lower consumption of gas, greater efficiency is realized. Gas of good heating quality, too, is cheaper. And maintenance *in situ* has been rendered so simple, and with simplicity has come economy, that there is now no valid excuse for not hiring-out fires at a paying rental in the same way as cooking-stoves.

The enhancement there has been in the efficiency of gas-fires has been the principal recommendation to greater adoption. In the olden days, we spoke with bated breath of the gas consumption of such fires. Those were the days when crudity had large rule, and when a single inefficient fire would cause a draught on the gas supply of perhaps 40 to 50 cubic feet an hour, and yet would not give nearly so much duty as a fire consuming (say) from 18 to 25 cubic feet an hour in these times. As in gas lighting, so in gas heating, efficiency and consumption have moved in opposite directions; as the one has expanded, the other has receded. For this we have only one descriptive term—that is "progress." The ease, too, of gas and air regulation, the new formation and rearrangement of the incandescing media, the accessibility of every part, and the interchangeability of parts are all eligible for classification under the same term. Viewing these things, we cannot rank ourselves with those who bemoan the slow rate of gas-fire advance, or who gibe at the fire manufacturers for lack of initiative and ambition, and for shambling progress. Such accusations are as untrue as they are uncalled for; and the traducers of the manufacturers' enlightened energy fail to make good their position by pointing to a short cut to greater perfection. We do not claim for the manufacturers the perfect gas-fire; but we do say that, comparing the gas-fire of to-day with its predecessor of but a few years since, there has been excellent advance. It has not been advance by leaps and bounds; it has, in fact, been so gradual that many have been almost insensible to it. But the cumulative effect is remarkable, and, being so, is highly creditable to the manufacturers.

In the gas-fires of this season, there is the testimony to the mutual helpfulness of open discussion of matters in which buyer and seller, user and manufacturer, are concerned. The report upon, and discussion at the last meeting of the Institution of Gas Engineers of, the results of the Leeds University tests have put makers of gas-fires on their mettle in their endeavour to secure the greatest efficiency in the matter of radiant heat. The percentage hitherto realized is not so great as it should be. A certain percentage of the heat units of the gas are required for chimney ventilation; but between this requirement and the heat radiated into a room, there is a margin of a no mean order that is not fully and properly accounted for, and to direct a greater proportion of this to more serviceable use must be the aim of manufacturers. The day of the deep fuel bed of a fire from front to back has departed never to return. The deep fuel bed was wasteful. It invited a strong draught, carrying with it much heat up the chimney. The deeper the bed of fuel from front to back, and the narrower across the front, the greater the obstruction to the radiation of heat into the room. The whole design of the fuel bed and opening was then opposed to the most useful heating effects. But all this has been changed. Long before the results of the Leeds University tests on an open fire were published, the manufacturers had got on to the right track in this regard. The shallow bed, the more open surface, and the nearer approach to the surface of the back fire-brick, were all movements in the right direction, and in favour of a larger proportion of radiant heat being usefully applied to the purpose of domestic heating, although accompanied by greater economy of the gaseous fuel. In the new fires this season are seen the receptivity of the makers, and their willingness to take advantage of suggestion, from whatever quarter it comes, when bearing the impress of practicability. Greater radiating surfaces have been secured by widening or heightening the face area of the fuel; and there is less obstruction to the heat available for radiation from the back of the fuel and fire-brick, by making the fuel cylinders elliptical in section, and thinner and more open in formation on the front side. The indications are encouraging to the gas supply industry lending their aid to the accumulation of improvement in a branch of manufacturing business in which useful achievements are of mutual advantage.

Promoters, Vendors, and Contractors.

We are enabled, in other columns, through the courtesy of Mr. E. H. Stevenson, to throw still more light upon the methods of the people who have in recent years given so much trouble to the gas industry, and by whose methods a certain amount of degradation has been brought upon it through their joint operations as promoters, vendors, and works contractors, from the notorious centre—99, Cannon Street. The figures now published are very instructive. They show the financial position of the Amman Valley Gas Company at the time the Bill was promoted by and through which it was hoped to get the better of the Ammanford District Council, who—and it is not surprising—had completely lost confidence in the persons who had chief hand in directing the fortunes of the Company. Their direction, as is well known, has ended in disaster and irretrievable loss to the shareholders. The financial statement shows that there is little chance of the preference and ordinary shareholders ever getting back one penny of the money subscribed. A large part of it has been expended without anything tangible existing to represent it. We do not know how much is due to creditors for work done as sub-contractors to that precious Eatonian institution, the Gas and Water Works Supplies and Construction Company, Limited; but we do know from the figures to hand that the public debenture subscription stands at £3980, and also that through the withdrawal of the Amman Valley Bill (unless there has been a voluntary cancellation), there is still close upon £8000 of debenture stock standing in the names of the vendors and contractors, and as security.

Therefore, whatever the award in the arbitration which is to determine the price to be paid by the Ammanford Company for the derelict works of the Amman Valley Company, the creditors of the latter no doubt will require the whole amount; and the shareholders can do nothing but look on while the spoil, such as it is, is being distributed among others. But had the Company gone on, and received all possible assistance from the District Council, we fail—after examining the financial statement before us, and noting the monstrous dissipation of capital there has been—to see how, under the scheme of that trinity of promoters, vendors, and contractors, a business could have been created in the district that would have brought to the shareholders an atom of consideration in the shape of dividend. The masked cunning there has been through this business is well shown by the fact that Eaton and his associates were willing to have the large appropriations—in the aggregate, upwards of £13,000—in shares and debenture stock cancelled by Parliament to get the Bill through, had other circumstances not intervened. Those appropriations represented almost as much as these people succeeded in drawing from the public—viz., £13,977, made up of £9997 preference and ordinary shares, and £3980 debenture stock; but, unlike the public, their holding of debenture stock preponderated their holding in shares. Of the £13,977 subscribed by the public, nearly one-fourth is entered up in the statement to issue expenses; and payments to the primary contractors for works and plant is seen to have been very

considerable. There is interest in learning the valuation placed upon the executed works and delivered plant by the arbitrator, and to make comparison. Meantime there is a pause in the activities of 99, Cannon Street. Gas company promoting, vending, and works contracting are not running quite so smoothly as the parties chiefly interested could desire; and there are indications that some of the older associates have found convenient places at which to effect a parting of the ways.

Since writing the above, further evidence has come to hand that not only are these professional promoters of feeble gas and water companies with an undue burden of capital being crippled by the loss of public confidence and the disclosures of the unsound character of their undertakings, but that Nemesis is actively pursuing them. We hope Nemesis will soon and effectually overtake them. A circular has been issued by a shareholder (the possessor of £350 in shares) in the Ticehurst and District Water and Gas Company to his fellow victims, asking that a conference may be held to consider their unenviable position, and see whether some concerted action cannot be taken. We are not at liberty to publish the circular, as it is marked "Private and Confi-"dential." But we understand from the communication that the shareholders have not been favoured by the Directors with accounts for the years 1905-8! and when the shareholders do venture to ask for information, they are met by a sphinx-like indifference, and curiosity as to what has become of their money and the prospects of ever handling some return from its foolish speculation is not satisfied. The circular gives a history of the Ticehurst concern, of the several shufflings of the cards that have taken place, and of the repeated extraction of fresh capital from the public, with information as to the names of the men who have played a part in that history. The disclosures in the communication establish, in certain of the transactions, a connection between, 99, Cannon Street, St. Stephen's Chambers, and Tokenhouse Buildings, and between men who have been Directors of Companies to which birth has been given at one or other of these addresses. What the victims of the subtle practices of the prime-movers in certain of these rotten Companies should do is to place their affairs for investigation in the hands of a gas engineer of recognized standing, an accountant with special knowledge of gas and water affairs, and a lawyer; and then consider whether the results warrant further proceedings. The affairs of some of these companies are now in such a position that this is a particularly opportune time for shareholders to press for a complete investigation, and not allow themselves to be further temporized with by soft words, bluff, or bluster.

Miners' Hours and Coal Output.

The position in the Welsh coal-field is described as a crisis; and there is talk of the owners having reached the limits of their patience. Recriminatory accusations flow freely between masters and men. The owners' feeling is that the men are seeking undue advantages through the Coal Mines (Eight Hours) Act; and the latter assert that the masters are trying to prevent the smooth working of the Act. Our sympathies, taking a disinterested view of the grounds of quarrel, are more with the masters than with the men. The Coal Mines (Eight Hours) Act was conceived, framed, and launched absolutely in the interests of the men; and, on all hands, they have (caring naught for others) been using the instrument effectually for their own ends, and have sought to construe a plain intention in respect of extra hours as best pleases them. The Act is part of the law of the land; and the owners have nothing to gain by anything but its strict observance. In charging the owners with not giving the Act fair play in face of the grasping attitude of the men in several places, is only one way of trying to cause public opinion to saddle the wrong horse in the event of trouble hereafter. But the main point of this reference to the coal position this week is that there is now official recognition, from the side of the men, as to the diminishing effect upon output of the operation of the Act. There has been a decline in production; and "Mabon" (Mr. W. Abraham, M.P.) acknowledges it. In an address to the Rhondda miners the other day, he said it was incorrect and misleading to suggest that the miners' leaders in the discussion on the Eight Hours' Bill had stated that there would be no diminution of output as the result of the passing of the measure. Mr. Abraham's recollection here does not square with our own. During the passing of the measure through Parliament, unlimited ridicule was poured, by the supporters of the Bill, upon those who alleged that the limitation of hours would have an ill-effect upon output. If the miners' immediate leaders had no part in this, they virtually endorsed it by maintaining a silent tongue on the point, and by not amending the "incorrect and misleading" assertions made by their vicarious spokesmen. "Mabon" now declares, however, that what the men's leaders did say, and continued to say, was that, if time were given for the making of the necessary changes consequent upon the curtailment of hours, then the output of coal could be fully maintained. There has been plenty of time given where the Act has come into operation for the making of "necessary" changes; but the "changes" that are causing the trouble are the unnecessary ones. It is remembered at this time that the President of the Board of Trade months ago journeyed to Wales, and told the miners that it was for them to prove to the country that the fears of reduced output and other evils arising from the Act were all ill-founded. The Welsh miners have their own way of following the counsel of their temporary mentor.

The Question of Coal Storage.

There are some matters which, though of the greatest importance to one gas-works, may not apply in the smallest degree to another; but this cannot be said of the question of the storage of coal. Coal must be kept on every works; and the storing of it has given rise to various serious problems. Under these circumstances, no apology to English readers is needed for the lengthy translated summary which appears in to-day's issue of a paper on the subject which was presented at the last meeting of the German Association of Gas and Water Engineers by Herr Prenger, the Manager of the Cologne Gas-Works. It will, of course, be understood that the problems arising are not precisely the same in all cases; and hence care has been taken to deal most fully with those portions of the paper which bear more particularly on storage under conditions which prevail in this country. The origin of Herr Prenger's contribution appears to have been a circular of inquiry which the Council of the German Association deemed it expedient to issue to the managers of a large number of undertakings, in order to collect from them information as to their experience and views on the more important points relating to the handling and storage of gas coal, on which great diversity of opinion had been found to exist. When the replies were received, they were placed in Herr Prenger's hands for collation, with a view to a summary and a report being prepared. It has often been our duty—but under widely different conditions—to condemn the circular of inquiry as a nuisance. That has been when the benefit to be derived was to accrue to a single individual or to a single undertaking. Here, however, the information sought was for the good of the industry as a whole; and so the Association were not only justified in sending round their questions, but are deserving of cordial thanks for having done so. Many particulars of value have in this way been got together which could not possibly have been collected in any other manner.

Investigations in Germany.

The present paper, as is pointed out, does not deal comprehensively with the results of all the inquiries, but is intended rather to draw attention to the diversity of views held and to the importance of obtaining further trustworthy observations on most of the points involved in the question of the storage of gas coal. This seems to promise further details with regard to the investigation at some future time; and should they be forthcoming, they will doubtless prove interesting. Then Dr. Bunte holds out hope of substantial addition to the existing stock of knowledge on the subject; for he stated, in the course of the discussion which took place on the paper, that opportunity had been taken of a meeting a short time before of about forty chemists from various German gas-works to ask them to give special attention to the effect of storage on coal at their own works, with a view to reporting their observations. A number of chemists have agreed to collaborate in making investigations; and by their co-operation, and that of the gas undertakings with which they are connected, it is anticipated that information will be secured for widely varied sets of conditions. By this means, says Dr. Bunte, it should be possible in the course of a year or two to form definite conclusions as to the effect on gas coal of storage under various conditions. Attention has already been given to the question at the Experimental Works

of the Association; but the tests on coal before and after being stored for a given time which were carried out there, referred only to a particular set of conditions. It is unnecessary here to refer to all the points dealt with in Herr Prenger's paper; but his statement may be noted, that the Stettin Gas-Works are about to make provision for storing under water 20,000 tons of English gas coal. From this installation, valuable information is looked for regarding the utility of wet storage when applied to gas coal. Wet coal, the author points out, taken direct from the store, could be carbonized without any difficulty whatever in large chambers and vertical retorts.

Gas Affairs at Bradford.

The report of the Chairman of the Finance and General Purposes Committee to the Bradford City Council on the results of the past year's working of the various undertakings of the Corporation, naturally included some remarks on the Gas Department. Contrary to the customary experience, it appears that there has been a diminished income from gas and residuals amounting to £8000, which, after charging interest and sinking fund, has resulted in a net loss for the year of £5306, as compared with a profit of £3071 for the previous twelve months. This falling off of £8000 in the gas-works and special repairs costing £5000 in the Water Department, practically account for the reduction which was experienced in the net income of all the trading concerns; the total being £21,419 on the present occasion, as against £36,428 a year ago. Under all the circumstances of the case, we are inclined to think that the Chairman was unduly pessimistic in his references to the Corporation's gas undertaking. The markets for coal and for residuals are, of course, outside the control of the management; and traders cannot even be persuaded to use more gas than is absolutely necessary during periods of industrial depression. These matters must be left to right themselves in their own good time. But in so far as it is possible to influence the use of gas by the price at which it is supplied, a cheap rate will be more likely to have this effect than would an increase in the charge. In any event, there is always time to raise the price; and it seems too early to do it after, as the Chairman of the Gas Committee pointed out, the very first year that the undertaking has shown a deficit—after having produced nearly £500,000 for the relief of the city rates. For having performed so signal a service as this to the city, the gas consumers deserve every possible consideration that can be shown them, particularly in times of stress. Such, however, as it is, the deficit is really more a question of figures than of fact; for it is stated that the street lighting costs the Gas Committee some £5000 a year more than the Council pay for it. Let this £5000 be forthwith transferred to the credit of the undertaking, and away goes the ground for suggesting any increase in the price of gas. In dealing with the question, there is one remark of the Chairman of the Finance Committee which is a little difficult to understand—namely, that the gas undertaking should not be obliged to rely upon its bye-products in order to make ends meet. This is rather a new teaching in the industry; and its acceptance would mean a vast alteration in the Bradford gas accounts. The Chairman of the Gas Committee pointed out that the residuals realize between £60,000 and £70,000 a year; and the suggestion that this amount should not be relied upon must mean, if it means anything, that a price must be charged for gas sufficient to meet all expenditure without taking into account in any way the possible returns from residuals. Such a proposal as this is hardly likely to find favour with the Gas Committee—or with the consumers.

National Free Labour Association.

As a somewhat refreshing counterblast to the annual Trades Union Congress, one is accustomed to look to the doings of the National Free Labour Association. The former body does not, as one might be tempted to conclude from the attitude on occasion adopted by it, represent by any means the whole of the labour of the United Kingdom. In fact, the Unions sending delegates to the recent Ipswich Congress number something like 1,700,000 members; whereas the Free Labour Association claim to represent about 700,000 "registered free labour wage-earners, who for most excellent reasons are outside the Trade Union and Socialistic ranks." If the Trades Unions are entitled to all the deference which they regard as due to them, then, also, the large organized body belonging to the "opposition" Association cannot be ignored. More will no doubt be heard of the National Free Labour Association when they hold their seventeenth annual congress next month; but meanwhile the *agenda* is before us, and it shows a striking difference from that of the Ipswich gathering in the number of resolutions to be submitted. There are in all only seven. The first calls for the repeal of the Trade Disputes Act, owing to the "enormous increase of personal assaults by Union pickets during labour disputes." Then there will be proposed a vote of "no confidence" in the Board of Trade Labour Department, and the Conciliation and Arbitration Boards recently created by the Government, on account of "Trades Union bias." By the following resolutions free labour representation is claimed on the proposed Labour Exchanges, the Mines Eight-Hours Act is condemned, confiscatory taxation is denounced, and the danger is pointed out of "Socialists' violent and seditious harangues." The remaining resolution may be quoted, without any comment, as it stands: "That, in the opinion of this Congress, the time has arrived, in the interests of the trade and labour of the country, and for the maintenance of industrial peace, when employers of labour and non-union workers should enter into closer relations for mutual support and assistance, in order to counteract the aggressive action of militant Trade Unionism, whose strike records are black with the foulest deeds of inhumanity, tyranny, and injustice to free labour workers, and whose socialistic legislative proposals, supported by the Government, are a serious injury and an increasing menace to the industries of the country, and to the general public welfare."

A Change of Attitude.

It seems almost impossible to keep abreast of the different phases of South Wales coal trade affairs just at the present time. A week ago, we had to record the fact that the masters had published a circular intimating that in a short time a resolution would be submitted at a meeting of the Coalowners' Association to serve notices on Oct. 1 either on all the workmen employed at all the collieries connected with the Association, or only upon the workmen employed at collieries where the owners are unable to introduce an afternoon shift except by paying a bonus turn. Coming as it did, on top of numerous other recent disputes, this appeared to augur a determination on the part of the masters to force to an issue the uncomfortable state into which matters in the coalfield generally had drifted. But this reading of the situation is no longer possible. Though there may have been some surprise caused by the coalowners' threat, the astonishment must have been greater when it was announced, at the conclusion of a meeting of the Coalowners' Association on Saturday, that, after considerable discussion, those present had decided to leave the disputed questions to the employers' representatives on the Conciliation Board, to be dealt with in such a manner as they may deem advisable. In the district, a compromise is considered possible on the lines of a surrender by the owners of their objection to the payment of the bonus turn, and a surrender by the men of their objection to the working of the extra hour demanded by the owners under the sixty-hours' clause. In this way, the employers may gain something by their threat to issue notices but reading between the lines, it is impossible to avoid coming to the conclusion that the true explanation of the present change of attitude is that the employers are not so efficiently organized as the men. From opinions published, it is clear that they are less unanimous than is the case with the miners.

Mr. William Henry Parker, Secretary to the Wakefield Gas Company, who died last July, left estate which has been sworn at £6212 gross and £3766 net.

The Status Prize, instituted by the Council of the Society of Engineers for the best essay on the subject of "How to Improve the Status of Engineers and Engineering, with Special Reference to Consulting Engineers," has this year been awarded to Mr. Allan Thomas. The prize essay will be read before the Society at Caxton Hall, Westminster, on the 4th prox. The prize is to be awarded for five years; this year being the first.

Intimation was received in London last week of the death of Madame Paul Durand, who was designated as "Administrateur Général" of one of our Paris contemporaries—"Le Gaz;" also Editor and Proprietor of the "Annuaire Général des Industries de l'Eclairage, du Chauffage, et de la Force Motrice par le Gaz et l'Electricité." Madame Durand, who was 61 years old, died yesterday week at her residence, Rue Fontaine, and was buried in the Montrouge Cemetery.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 773.)

Business on the Stock Exchange last week was decidedly quiet; the ordinary slackness of the autumn season having a Jewish holiday on Thursday superadded to it as a sedative. The prevailing tendency taken all round was certainly dull, though relieved at times by buoyancy in speculative lines. The adverse factors were dearer gold, coal-mine apprehensions, poor railway returns, and bad weather. On the opening day, the first of these was felt by Consols, which dropped $\frac{3}{16}$; and even Americans and such like were sensitive and weaker. On Tuesday, weakness proceeded from almost general stagnation, and prices gave way in pretty well every department. Wednesday brought some improvement in things which were susceptible of improving American influence. But outside of this, gilt-edged were weak, Consols fell $\frac{1}{8}$, and Railways were depressed. Thursday was very quiet; but, aided by extreme vivacity in Americans, the tendency was fairly cheerful. Friday brought no increase in business; but the cheerfulness did not altogether die away, and Railways brightened up quite a bit. On Saturday, matters were little changed; but Consols fell another $\frac{1}{16}$. In the Money Market, there was no cessation to the conditions of extreme ease which have now so long ruled; but the demand for gold made discount terms appreciably harder. In the Gas Market, business well maintained the rate of activity which had characterized the previous week; the two leading issues being well dealt in. The tendency, too, left nothing to be desired in point of buoyancy, and many quotations made further advances, while none receded. In Gaslight and Coke issues, the ordinary was in strong demand and advanced a point, with transactions which steadily rose from 104½ to 106¼. The secured issues were quiet and firm. The maximum marked 88¾ (a rise of 1), the preference 104, and the debenture 86. South Metropolitan was unchanged, marking from 119½ to 120½; and the debenture was done at 85⅜ and 86. In Commercials the 4 per cent. marked 108½ and 109¾; and the 3½ per cent. was a point stronger at 106. Among the Suburban and Provincial group, Brentford old changed hands at 253½ (a rise of 1); and West Ham at 124 and 124½. There were rises of a point in Hastings, Ilford, Lea Bridge, Southampton, and Tottenham; of half-a-point in Newcastle; and of 3 in Sheffield. The Continental compauies were very inactive. Imperial was done at from 178½ to 180½, Union at 96, ditto preference at 139 and 139½, and Malta at 5⅛. Among the undertakings of the remoter world, Bombay old was done at 5¾ and 5⅞, ditto new at $4\frac{9}{16}$, Buenos Ayres debenture at 95¼ (a rise of 1), Cape Town preference at 5⅜ and 5½, Oriental at 139½ and 140, Primitiva at from $7\frac{3}{32}$ to 7¼, ditto preference at $5\frac{13}{32}$ and $5\frac{7}{16}$, River Plate at $16\frac{13}{16}$ and 16⅞, and San Paulo preference at 12½.

ELECTRICITY SUPPLY MEMORANDA.

Water-Heating by Electricity—The "Therol" Heater—Constant Electricity Consumption, Inconstant Hot-Water Service—The Problem of Water Heating Still Unsolved—Municipal Trading in Fittings—The "Electrical Contractor" Makes a Humorous Threat—Electrolysis.

One of the difficulties the gas industry had to contend with, when cooking by gas became so largely the vogue, was that of providing economically a supply of hot water on tap in lieu of the convenience furnished by the coal kitchen range. This has been successfully overcome, with both convenience and economy to the householder, by the introduction into his water-circulating system of a gas-heated boiler, which can be put into action as and when required, thus obviating the necessity of keeping a coal fire continually and wastefully burning in the kitchen range, or the gas-boiler can be cut out of the circulating system when the coal-range is in use—in this way giving the householder complete liberty in the ways and means of obtaining his hot water supply. These gas-boilers, as well as ventilated geysers, have become very popular in many towns. Our electrical friends have not (being hedged in by all sorts of restrictions) found such a practical way out of the difficulty. The first trouble in the way of success is that one cannot get more out of electrical energy than it contains. Improvements may be made in appliances by which it is used, so that the use may be more economical. But there is a limit to the thermal value of electricity; and the point of that limit is much more restricted than in the case of gas, in relation to the quantity of current and gas purchasable for a given sum. Another difficulty is the design of suitable apparatus for electrical water heating; and a further one is that the liberty of the householder must not be infringed—he must be in the position to get hot water at any temperature at will as in the case of gas heating. The first real step taken in the endeavour to surmount these difficulties has been in the "Therol" water-heater—the invention of Mr. Bell, the Electrical Engineer at Hammersmith. We can congratulate Mr. Bell upon his ingenuity. He has attempted in a practical way a solution of the difficulties; but he has not gone very far in showing how electrical water heating can be made a commercial and domestic success.

Under this invention, the user must, year in year out, morn till night and night till morn, be a constant consumer of electricity—if he wants a supply of hot water. In the size of heater giving an average of 25 gallons of water per day at 110° Fahr., or down to only 9 gallons at boiling-point, the householder must use electricity at the rate of 200 watts per hour, or 4·8 units of electricity per day, which equals 1752 units of electricity per annum! As stated, for this consumption the average daily output of water at 110° Fahr. is 25 gallons; and it is understood that this can be tapped at one time, providing a period has elapsed since hot water was drawn off. This quantity of water, however, will not rise many inches in a domestic bath (say) 5½ feet long and 2 feet wide; and so it seems that only one person of a household will be able to have a limited supply of hot water for a bath each day, and all the other members must wait their day's turn. But should greater quantities of water be drawn off in one day—up to the maximum of 37 gallons at 110°, or 14 gallons at boiling-point—the quantity available next day will be correspondingly reduced. The heater, be it remembered, can only give its full output after one day's continuous storage of energy. Larger sizes of the heater are in course of construction; but what they are going to tot up to in cost and consumption is not yet stated. Now, from the figures given will be seen at a glance the limited quantity of boiling water that will be available to the householder, on an average, per day; and how much he will have to depend upon the generosity of the central station administration as to the price charged for this constant consumption—which will go on wastefully in summer, and be of comparatively little use to him in the winter. We imagine there are few householders who will be prepared to be placed under the bondage of a limit to the supply of hot water, and of compulsory use of electricity at all times to obtain it. It is an indispensable condition that the use of the electricity shall be continuous or electrical water heating is at once placed on the prohibitive side of the hedge for all but millionaires and people of considerable leisure. It is the 100 per cent. constant load that will enable the station engineer to supply the necessary electricity cheaply. The idea has been started that, with this heater, the householder will be able to cut it out during the hours of lighting and use the current for his lamps, or at other periods of the day for a griller, or other purpose, and so have only the expense of one circuit, and the privilege of one price. But however the consumer uses the electricity, his consumption must not be more nor less than that contracted for—that is to say, for the 25-gallon heater 200 watts per hour from Jan. 1 to Dec. 31. The station engineer may appreciate the constant 100 per cent. load; but he will have objections to the loss of the 4d., 5d., or 6d. per unit for the current consumed for private lighting, and only an all-round charge of 0·5d. for the 4·8 units of electricity consumed per hour under the proposed water-heating system. On a schedule of £1 per kilowatt per quarter, *plus* ½d. per unit, the cost of energy would average 0·61d. per unit, or a total of £4 9s. 1d. per annum for an average 25 gallons of hot (110° Fahr.) water per day; and this is "said" to be equivalent to gas at 3s. per 1000 cubic feet. Before this silly statement is further circulated, we advise our electrical friends to study the question of the relative thermal values of gas and electricity, and the high efficiency and capacities of gas-heated boilers and geysers, for giving promptly a supply of water from low to high temperatures without heat storage and continuous use of gas.

Of course, hot water is not constantly required in a household; and the principle underlying this heater is not the storage of hot water but the storage of heat. This, too, is an essential if the householder is not to be kept waiting a considerable time for a supply of hot water. When water is not being used, the portion of the heater storing the heat will be raised to a certain temperature; and the continuous supply of current will maintain it at the given temperature, by affording compensation for the radiation losses. This is an interesting feature, and therefore a description will not be out of place here. Water heating, too, being a branch of business that is being busily cultivated now by gas undertakings, the managers of the commercial departments of those undertakings will be pleased to know something as to the organization of the new competitor in this line. All the electrical papers have been devoting space to more or less laudatory accounts of the new comer. Among them the "Electrician" gives a clear indication of the constitution of the new apparatus; and that is the source of the following description:

> In its simplest form, the apparatus consists of a block of cast iron [elsewhere we learn this weighs, in the 25-gallon size, 2 cwt.] round a coil of pipe. This block is embedded in, and covered with, a layer of magnesia lagging some 2 inches thick. The top of the block is hollowed out into a cylindrical form; and in this hollow is placed the heating element, consisting of four coils of iron wire insulated with mica. The block of iron is then continuously heated by electricity; and water is, when required, passed through the pipe and heated. Further economy is effected by introducing between the lagging and the outer cover a small reservoir, which is in turn protected by lagging from the outermost surface of the heater, and which serves for raising slightly the temperature of the incoming water before it is introduced to the heater proper. Since the coil of pipe through which the water passes must have sufficient surface for heating the water when the block is comparatively cool, it follows that, when the block is very hot, the water will be converted into steam. It is necessary, therefore, to mix the issuing steam with water, and thus reduce it to a suitable temperature. There being no satisfactory valve for the purpose, a special one has been designed, by the use of which it is claimed that a mixture of the steam and water can be completely effected; and the temperature of the mixture adjusted at will. Pipes are brought up from the main and from the hot-water chamber to this mixer, where, by placing the tap in the appropriate position, either cold, tepid, or hot water can be obtained.

From this description, it will be seen that the heater is simple in construction, entirely self-contained, and requires little alteration of any existing pipework when it is installed. Hot water is always available, and by suitably adjusting the tap may be drawn off at any [within the limits already stated] desired temperature. There are no noxious gases or products of combustion, and no flue or chimney is required.

We could hardly expect an electrical contemporary to refer to a matter of this kind without allusion to noxious gases or products of combustion; and, respecting the flue-pipe, as the "Therol" water-heater is priced at £15 15s., between this and the price of a geyser giving considerably more than 25 gallons of boiling—not merely hot—water a day, there is such a big margin of saving in first cost (to say nothing of the saving in the daily expenditure for heating) that the cost of a flue-pipe is of small moment.

Considering the various matters set forth in the preceding paragraphs, no one will be prepared to positively assert that he seriously thinks the "Therol" heater has solved the problem of water heating by electricity; and while the thermal value for a given expenditure is so much less in the case of electricity than in that of gas, the problem of economically heating water by the former agency will indeed be a difficult one to solve. Commercially, no less than in constantly meeting a domestic convenience, there are such marked and insuperable limitations to the employment of electricity for this purpose, that there is confidence in saying that the little burst of elation the electricity industry has felt over the coming of the "Therol" heater will soon fade, and be nothing more than a memory. The history of the electrical industry contains many precedents of this kind.

The question of municipal trading in electrical fittings is agitating the Sheffield Corporation, and promises to do so still more in the future, as a test-case is being worked up between the local contractors and the Corporation—the latter of whom are charged with in this matter exceeding their legal powers. This is the case for which the support of members of the Electrical Contractors' Association has been asked by their organ the "Electrical Contractor." Success is apparently attending the appeal, as in the September issue there is a statement that nearly 100 members guarantee "a very substantial sum" towards the costs. We are on dangerous ground in touching upon this matter, for we see that the editor takes umbrage at our recent reference to the "Electrical Contractor's" "must," in connection with what is described (also in the September issue) as "the Lord's [*sic*] amendment" to the now defunct fittings section of the Electric Lighting Acts (Amendment) Bill. Our friend is sometimes very amusing; and in his anger he is doubly so. On this occasion, he concludes his reference to the "JOURNAL" by this weighty threat: "We will bang the door of this gas journal's editorial sanctum—thereby leaving it in darkness, with another broken mantle." This has not come off yet; so we may anticipate a little fun in our usually serene and serious environment. But we pass from our friend's petulance to the subject in hand—that is, municipal trading in fitting work. Let us make amends, and soothe him with a word of congratulation on what has occurred at Sheffield. The electrical contractors are not without friends in the Council. An attempt was made the other day to get the Council to order departments of the Corporation to give out their electrical work direct to the electrical department instead of inviting tenders. But the proposal did not succeed; on voting a substantial majority rejecting it. The fact, however, that the motion was made shows the narrow spirit engendered and fostered by municipalities (as currently constituted) engaging in trading. Good local government demands recognition of the system of tendering for public work, and acceptance of tenders without fear or favour.

The question of electrolysis comes before us spasmodically. An instance of serious trouble has travelled from Winnipeg; and, as in this case the source of the mischief has been proved, a secondary serious question is, Who is liable for the damage that has been done? The water-mains and telephone cables are the sufferers; and the Winnipeg Electric Railway Company's system is in fault. The water-mains have been well perforated; and all through inefficient and broken-down bonding of the rails of the tramway system. To connect the rails, bonds were used of No. 0 B and S copper wire, having a resistance equivalent to from 20 to 60 feet of the rails used, which vary in weight from 70 lbs. to 95 lbs. per yard. A copper cable, 0·5 square inch in area, is laid between the rails; and this is cross-bonded to the track at intervals. It was found on examination that many of the track-bonds were broken; and in these places current escaped to the water-pipes. The remedy has been the rebonding of the rails in a more effective manner; but this does not remedy the damage to the water-mains and other underground property.

Wales and Monmouthshire District Institution of Gas Engineers and Managers.—The autumn meeting of the Institution will take place in the Royal Gate House Hotel Assembly Rooms at Tenby, on Wednesday, the 29th inst. The new President (Mr. A. H. Brookman) will deliver his Inaugural Address; and he will afterwards give a description of the Tenby Gas-Works. There will also be a discussion on "Some Points of Gas-Works Economy," which will be opened by Mr. J. H. Canning, of Newport (Mon.). At the conclusion of the meeting, the company will take luncheon in the hotel, on the invitation of the Chairman and Directors of the Tenby Gas Consumers' Company. Afterwards, members will visit the gas-works or the various places of interest in the neighbourhood.

GAS ACTS FOR 1909.

THE gas measures for the session still unterminated, in the form in which they have received the Royal Assent, are now before us; and this week we commence a review of their principal provisions, pointing out at the same time the clauses in which, being main ones, changes have occurred. The successful measures of the Companies who sought incorporation and statutory powers are first noticed. There were half-a-dozen of these Bills introduced; but the Amman Valley Company having fortunately been condemned to extinction, the Lisburn Company having agreed to part with their works to the Local Authority, and the Biddulph, Bradley Green, and Black Bull Company having withdrawn their Bill, only three measures in this group are left for review.

Surrounding the Ammanford Act, there is great interest, inasmuch as the Company that is formed under it will absorb the derelict works of the Amman Valley Gas Company, which has the reputation of being one of the launchings of the 99, Cannon Street promoting coterie headed by Edmund Eaton. The Amman Valley Company originally promoted a Bill; but the prime-movers found very good reasons for coming to an agreement with those who were backing the Ammanford measure, and for arranging as to the transfer of the property, and the withdrawal of the Amman Valley Gas Bill. But this, it will be remembered, did not prevent Mr. E. H. Stevenson and Mr. Baker (the Parliamentary Agent for the Ammanford Bill) speaking their minds, before the members of the Unopposed Bills Committee of the Commons, on the subject of the promotion of the Amman Valley Company and the position of the deluded shareholders. From the preamble of the Ammanford Act now before us, the history of the Amman Valley Company has been deleted. But it will stand on record in our pages for Jan. 5 last, with a supplement in this issue. The new Company authorized under the Ammanford Act will purchase the Amman Valley concern by arbitration; and will conduct the gas supply within the urban district of Ammanford and the parish of Llandebie in the county of Carmarthen. The arbitration is to be by a single arbitrator nominated by the Board of Trade. Originally it was proposed to allocate shares in the Ammanford Company to the Amman Valley shareholders; now it is to be a purchase outright, at a fair price for the works, so that the concern shall not be capital-logged. The capital of the Company is to be £18,000 in £1 shares, with one-third borrowing powers. The maximum rate of dividend is to be 8 per cent. A reserve fund up to one-tenth of the paid-up capital is prescribed; and power is given to create a special purposes fund. With regard to excess profits, the amount allowed to be carried forward is not to exceed the sum required to pay the maximum dividend for one year on the paid-up capital. In the clauses giving protection to the District Council, it is enacted that the Company are not to open a greater continuous length of street than 100 yards, nor leave a less space than 50 yards between any two consecutive openings, nor are they to open a greater length of street than 50 yards at any place where only one cart can pass at the side, or more than 100 yards where only two carts can pass at the same time. In the application of the provisions of the Gas-Works Clauses Act, 1847, with respect to the breaking-up of streets for the purpose of laying pipes, the notice required by section 8 of the Act is not to be less than seven days, instead of three days; but this provision is not to apply in cases of emergency. By another provision, it is decreed—

> The Company shall not manufacture or supply gas from, or by means of, the existing gas-works, mains, and other works of the Limited Company to be acquired by the Company under this Act, unless and until such works shall, at the expense of the Company, have been inspected by an engineer to be agreed by the Council and the Company, or, failing agreement, to be appointed by the President of the Institution of Civil Engineers, on the application of either party, and such works of repair or other works as he may deem necessary have been executed to his satisfaction, and the Company produce to the Council the certificate of such engineer that the said works are in all respects fit and proper for the manufacture of gas.

The maximum price for gas is placed at 4s. 3d. per 1000 cubic feet; in the Bill the standard price was 3s. 9d., with sliding-scale. The illuminating standard for the gas is 14 candles, tested by the "Metropolitan" No. 2 burner. Power is given to the District Council to purchase the undertaking after 21 years from the passing of the Act without opposition from the Company. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Act of the Blackwood Gas Company defines in detail the limits of supply in the urban districts of Mynyddislwyn and Bedwellty. When noticing the Bill, historical information was given concerning the Company. The capital is to be £30,000, whereof £7500 is to represent the original capital, and £22,500 the additional capital, of which not more than £10,000 is to be raised as preference stock or shares. Borrowing powers are granted at the usual one-third rate. The new auction clause is applied to the stock and shares. The original capital is to be entitled to a maximum dividend of 10 per cent.; the additional capital to one of 7 per cent.; while the preference capital is to receive 6 per cent. The special purposes fund clause is adopted. The carry-forward is limited to an amount equal to a year's dividend. The price of gas is not to exceed 5s. per 1000 cubic feet within a radius of 1 mile from the gas-works lands, and 5s. 6d. beyond; while the price to be charged for gas supplied for public lighting is not to

exceed 4s. 6d. and 5s. respectively. The ordinary prepayment meter clauses are inserted. Regarding illuminating power, the standard is to be 14 candles, tested by the "Metropolitan" No. 2 burner. A purchase clause is inserted, operative within twelve months after the expiration of 20 years from the passing of the Act. [*Parliamentary Agents: Messrs. Lees and Co.*]

In the Littlehampton Gas Act, the extended limits of the Company are defined. The capital authorized is £59,025, which is a drop of £15,000 since the Bill was introduced. Of the total authorization, £5300 is to be called "A" ordinary shares, £23,725 "B" ordinary shares, and £30,000 "C" ordinary shares. The "A" shares are to be divided among, and vested in, the several persons who, before the passing of the Act, were registered as holders of 1060 shares issued under the authority of the Order of 1875 in proportion to the amount of shares held by them. Similarly the "B" shares will be divided among the holders of 4745 shares issued under the Orders of 1888 and 1900. The "C" capital represents the new additional, of which not more than £10,000 is to be issued as preference. The standard dividends on the three classes of shares are 10, 7, and 5 per cent. respectively. A special purposes fund is authorized, as well as a reserve fund. The revenue carry-forward is not to exceed the amount required to pay a year's dividend at the authorized rate. The new auction clause is applied. As to borrowing powers, the Company are allowed to borrow £9650 (including £7100 already borrowed) in respect of the original capital, and £10,000 in respect of the additional capital. Land is scheduled for manufacturing works. The standard price of gas is to be 4s. 3d. per 1000 cubic feet, except within Angmering, Kingston, and Ferring, in which areas the price is to be 6d. in excess of the price for the time being charged within the remaining parts of the limit of supply (4s. 9d. in respect of the latter districts was mentioned in the Bill). Under the sliding-scale, changes of 1d. in price will vary the dividend by 5s. per cent. on the "A" and "B" shares, and by 2s. 6d. on the "C" shares. The ordinary prepayment meter clause appears. The illuminating standard of the gas is to be 15 candles, tested by the "Metropolitan" No. 2 burner. The 10 and 15 per cent. discounts clause stands as part of the measure. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

We also commence the review of the new powers obtained by Gas Companies previously under statutory authority.

It is a substantial Act of which the Aldershot Gas and Water Company have become possessed. Gas and electricity supply powers form the greater part of it. In regard to the supply of the former, the extension sought of the limits of supply has been allowed. In connection with these extensions, the agreements with the Hartley Wintney and Odiham Gas Companies for the purchase of their property have been confirmed. The settled consideration in the former case, other than for stocks and stores, is £3000; and the transfer is to take place on Sept. 29. The same date is fixed for the transfer of the Odiham Company, to whom the sum of £1600 is to be paid. Within the extended limits of supply, the price of gas is never to be more than 1s. 6d., or, for a period of seven years from the passing of the Act, less than 1s. per 1000 cubic feet, in excess of the price for the time being charged within Aldershot. There was a section in the Bill which proposed, in the words of the side heading, to give the Company power, notwithstanding section 27 of the Order of 1903, to supply gas in the Yorktown district; but, in its place, there now stands a section which repeals so much of the North Camp Order of 1877, the Order of 1890, and the Act of 1896, as authorizes the Company to supply gas in, or for use within, the limits within which the Yorktown and Blackwater Gas Company are authorized to supply. Authority is given relative to the construction and maintenance of works on scheduled lands. The Company have secured the right to supply power gas, and in regard thereto have exemption from the conditions under which they supply ordinary gas in respect of power, pressure, purity, testing, and price:

> Provided that the Company shall not enter into any agreement for the supply of power gas save on such terms as, having regard to the circumstances of the supply contemplated by the agreement, shall secure as far as is reasonably practicable that the receipts on revenue account shall cover the expenditure on such account and interest on the capital outlay involved at the rate of 7 per cent. per annum: Provided further, that the Company shall not, without the previous consent in writing of the Aldershot Council, under the hand of their Clerk, lay any mains for the supply of power gas in Aldershot, except in the portion of Ash Road between Ash Bridge and the junction of North Lane with Ash Road, and in the portion of North Lane between such junction and the entrance from North Lane to the Company's gas-works.

All the usual regulating and penalizing provisions as to power gas supply are included in the measure. The power under the 1882 Act of the Ascot District Gas and Electricity Company to supply gas in Ash is repealed. The clauses referring to the supply of electricity within specified limits have been extended by certain conditions affecting the territory concerned. The limits include the parishes of Farnborough, Fleet, Cove, Crookham, Hawley-with-Minley, Yateley, and Frimley (to the extent not comprised within the limits for the supply of gas of the Yorktown and Blackwater Company), as well as Ash and Seale. There is a stipulation that the Company are not to supply within any part of Frimley unless either the Frimley Urban District Council shall have given their consent thereto under their common seal, or a period of one year from the passing of the Act shall have elapsed without the Council having obtained powers authorizing them to supply electricity. And the Board of Trade, in granting any Provisional Order to the Council, may, by such Order, revoke or modify the Company's powers of electrical supply within the parish and urban district. The powers of supply are to cease in the parishes of Ash and Seale if not exercised within five years. Land is scheduled for generating-stations; but in respect of other land now belonging to the Company, it may be appropriated and used for the same purpose with the consent of the Board of Trade, but only after notice has been given by advertisement, or otherwise as the Board may direct, to the owners and lessees of lands situate within 300 yards of the land upon which the generating station is to be constructed, and an opportunity has been given to those owners and lessees of stating any objection they may have thereto. In a section giving power to make agreements for the supply of electrical energy to local authorities, &c., the Company are debarred from exercising the powers conferred by the section within the authorized area of supply of the Yorktown and Blackwater Company or of the Ascot District Gas and Electricity Company without getting the previous consent of those Companies. The Company are to lay their cables in both Frimley and Farnborough within two years of the powers coming into force, and in Fleet within three years of the passing of the Act, but certain extensions of these periods are within the discretion of the Board of Trade. The Company are protected in the matter of standby electricity supplies where there is a separate supply, unless the consumer shall have "previously agreed to pay to the Company such minimum sum as will give to the Company a reasonable return on the capital expenditure and other standing charges incurred by the Company to meet the possible maximum demand of such person." The Company are not to supply energy to any Company, person, or Government department either in Aldershot or for use in Aldershot. The name of the Company is to be changed to the Aldershot Gas, Water, and District Lighting Company. The capital is to be consolidated on the lines sketched in our issue for Jan. 12 last—the "A" stock carrying a standard dividend of 5 per cent., the "B" stock 3½ per cent., the "C" stock 5 per cent., and the preference stock 4 per cent. As heretofore, the standard price is to be 3s. 8d. per 1000 cubic feet—the sliding-scale to apply half-yearly with 9d. per cent. variation in dividend for every 1d. change in price. The additional capital is fixed at £200,000 of "C" consolidated stock. New issues of stock may be offered to consumers and employees; and to sales by auction or tender, the new form of clause applies. The borrowing powers are to equal one-third part of the amount of the additional capital raised under the powers of the Act. Authority is taken to form a special purposes fund. Authorization is given to the construction of a tramroad in connection with the Company's existing one The clauses affecting this have been considerably extended since the Bill was introduced. Reference was made last week (p. 681) to a clause regarding pipe-depths in the county of Surrey. [*Parliamentary Agents: Messrs. Blyth, Dutton, Hartley, and Blyth.*]

PARLIAMENTARY MUNICIPAL TRADING RETURN.

Another instalment was issued last week of the return regarding municipal trading in the United Kingdom which is being prepared on the initiation of Mr. Chiozza Money, the Member for North Paddington. Nearly three years have elapsed since the return was moved for; and even yet there are several parts still to come. The present volume deals with such of the municipal boroughs specified in the resolution of the House of Commons as are situate in the geographical counties of Lancaster and Chester—namely, Liverpool, Manchester, Salford, Bolton, Oldham, Blackburn, Preston, Birkenhead, Burnley, Stockport, and Blackpool.

The volumes are not being issued in order of number; for Parts I. and VI. were noticed in the "Journal" for June 22 last, while the present one is Part II. As already explained, the return is intended to show trading statistics for the London County Council, the Corporation of the City of London, the Council of each Metropolitan Borough, the Corporations of the Municipal Boroughs of Liverpool, Manchester, Birmingham, Leeds, Sheffield, Bristol, Bradford, West Ham, Newcastle-upon-Tyne, Kingston-upon-Hull, Nottingham, Salford, Leicester, Portsmouth, Bolton, Cardiff, Sunderland, Oldham, Croydon, Blackburn, Brighton, Derby, Preston, Norwich, Birkenhead, Gateshead, Plymouth, Halifax, Southampton, South Shields, Burnley, East Ham, Huddersfield, Swansea, Wolverhampton, Stockport, Middlesbrough, Stockton-on-Tees, and Blackpool, and the Corporations of Edinburgh, Glasgow, Dundee, and Aberdeen. It is to indicate the nature and extent and, for each of the last four years for which figures are available, the financial results of reproductive municipal undertakings—including, for each undertaking separately, a short description thereof, date and terms of original acquisition, or establishment or subsequent extension, how managed, capital employed and how obtained, value of the undertaking, capital paid off and outstanding, loan charges, provision for depreciation, gross income and expenditure, net profit or loss, how profit is allocated or loss met, amount of relief or burden to rates, number and salaries of the chief paid officials, number of workpeople, rate of wages paid in chief classes of labour, and

prices charged for products or services supplied or rendered. As a matter of fact, the boroughs mentioned above are all those which in 1901 had a population of upwards of 90,000, with the addition of two smaller ones—Stockton-on-Tees and Blackpool. The form in which the information has been asked for and supplied was explained when noticing the earlier issued parts; and it is therefore unnecessary to repeat it here.

Of the eleven boroughs comprised in the instalment now under notice, the number of reproductive undertakings with regard to which statistics fall to be included are for Liverpool six, Manchester seven, Salford seven, Bolton seven, Oldham seven, Blackburn six, Preston five, Birkenhead eight, Burnley nine, Stockport six, and Blackpool five. Liverpool and Preston are, of course, the only two cases in which the undertakings do not embrace gas-works; while in all but one instance—that of Blackpool—is water supply included. Even Blackpool has a sea-water supply undertaking, the deficiency in revenue from which had been met by a charge on a general district rate. Ten of the boroughs have electricity works—the omission being Preston; and all have tramways, as well as markets. Ten have baths; and four, working-class dwellings. Then there are a few undertakings of a miscellaneous character. For instance, Bolton and Burnley have cemeteries; while in Oldham flagmaking is carried on. At Preston there is the Ribble Navigation; and at Birkenhead, ferries. Burnley also possesses cold-air stores and a sterilized milk depôt.

During the four years mentioned in the return—1903-4-5-6—the Liverpool rates received about £67,000 from the electricity undertaking, £110,000 from the tramways, and £68,000 from markets. In Manchester, the gas undertaking contributed some £230,000, the tramways £172,000, and the markets £52,000. Salford similarly benefited from the water-works to the extent of £14,500, the gas-works £105,000, the electricity works £16,000, the tramways £48,000, and the markets £147. At Bolton, the water-works have handed over to the rates £45,000, the gas-works £78,000, the electrical undertaking £23,000, the tramways £15,000, and the markets £7000. The Oldham water-works have contributed £6000 (all in the year 1903-4), the gas-works £32,000, the electrical undertaking £1000 (all in the year 1903-4), and the markets £9000. The Blackburn markets have handed over £18,000; and the Preston markets, £10,000. At Birkenhead, the water-works contributed £12,000, the gas-works £34,000, and the ferries £3500 (all in the year 1902-3). At Burnley, the rates have benefited by £500 from the water-works, £40,000 from the gas-works, £12,000 from the electrical undertaking, £4000 from the markets, and £1000 from the cold-air stores. The Stockport gas-works have given for the same purpose £39,000, the electrical undertaking £1000 (all in the year 1905-6), the tramways £2500 (all in the year 1905-6), and the markets £600. At Blackpool, the gas-works have handed over £61,000, the electricity undertaking £10,000, the tramways £10,000, the markets £1400.

It is impossible to deal more fully here with the enormous amount of matter and multifarious tables of which the volume is constituted; but from the brief particulars given, it will be seen that out of the seventy-three "reproductive" undertakings owned by the eleven boroughs whose returns fall to be included, only some thirty-eight are stated to have contributed any sum over the four years mentioned—that is, 1902-3 to 1905-6—towards the relief of the rates. Gas, of course, comes easily first, with a total of £619,000, more than one-third of which falls under the head of Manchester. Next in order are tramways, with £358,000, then markets £183,000, electricity £130,000, and water £78,000. The remaining two items—one case each—are ferries £3500, and cold-air stores £1000. Some of the undertakings, it need hardly be pointed out, have been brought into being for sanitary reasons, and not really as trading concerns. Under this head may perhaps be included workmen's dwellings, baths, cemeteries, and the sterilized milk depôt. Water-works might also to a large extent be classed among the undertakings whose main object is to minister to the health of the citizens—though it is true that in very many cases a plentiful and wholesome supply of water has owed its origin to private enterprise, and not to the efforts of local governing bodies. Many of the concerns not being, therefore, primarily profit-earning, no good purpose would be served by detailing the deficiences incurred in different directions.

Well, then, as a result of the dip into the parliamentary return we see that in four years seventy-three "reproductive" undertakings coutributed a total of about £1,372,500 in aid of the rates of eleven boroughs, nearly one-half of which came from eight gas undertakings. For the amount of capital which has produced this result, inquirers must be referred to the volume itself. The task of adding it up is too big a one for us to undertake just now.

While referring to so large an extent to the profits made on municipal trading concerns, and handed over to the rates, it must not be assumed that we regard this as any adequate test of the success or otherwise of such enterprises. The relief of the general body of ratepayers at the expense of a particular section of consumers or customers, has times out of number been deprecated in these pages. This aspect of the matter has merely been taken as probably the most popular feature of the return—and one which it was no doubt largely designed to bring out.

In leaving the volume, the hope may, with all respect, be expressed that it will prove of good use both to the Honourable Member on whose initiation it and the remainder of the series are being prepared and also to the numerous other statistically-minded students of the vexed subject of municipal trading.

TECHNOLOGY AS EXEMPLIFIED BY THE ST. HELENS RETORTS.

By Thomas Holgate, F.C.S., M.Inst.C.E.

At the recent meeting of the Institution of Gas Engineers, more than one speaker expressed the idea that our conceptions as to carbonizing are at present in a state of flux, and that while the newer methods of working had thrown light in some directions, they had darkened others. The actions that take place inside a retort, vertical or horizontal, are admittedly so complicated that he is wise who is content to accumulate facts as extensively as possible before attempting to generalize upon the subject. But this operation of gathering facts is not without difficulty; and the careful student is often at a loss to know what is the exact interpretation to be put upon the data placed before him. The incompleteness and lack of system which characterize the returns, in many cases make it impossible to arrive at all-round facts that are convincing; and too often this difficulty must be the accepted explanation why so many engineers are chary in considering any departure from ordinary methods of gas making. To endeavour to obtain such facts is the object of the following investigation into a system which has results duly accredited by more than one experimentalist. But if any lessons towards the co-ordination of results of working be deduced therefrom, it is hoped they will be

Table I.—*Tests in Vertical Retorts.*

—	Test by Mr. J. E. Blundell.	Test by Dr. H. G. Colman.	Test by Dr. H. G. Colman.	Test by Mr. J. E. Blundell.	Line No.
Class of coal used . . .	Washed nuts	Washed nuts	Un-screened	Washed slack and washed Arley slack	
Origin of coal	Orrell, near Wigan	Orrell, near Wigan	Thornley, Durham		
Percentage of moisture in coal	5·35	3·95	1·08	..	1
Percentage of ash in coal	..	6·94	3·24	..	2
,, ,, coal substance.	..	89·11	95·68	..	3
Cubic feet of gas per ton of coal (at 60° Fahr. and 30 in. bar.)	11,779 (*a*)	11,448	13,102	11,551 (*b*)	4
Illuminating power per cubic foot in No. 2 Metropolitan burner .	3·148	3·256	3·112	3·346	5
Illuminating power in candles per ton of coal.	37,080	37,274	40,773	38,650	6
Observed calorific value per cubic foot in B.Th.U.. . . . gross	600·25	588·8	573·6	592·67	7
Ditto . . . . . net	541·94	529·6	514·5	542·50	8
Ditto . . . difference	58·31	59·2	59·1	50·17	9
Observed calorific value per ton of coal . gross	7,070,344	6,740,582	7,515,307	6,845,931	10
Ditto . . . . . net	6,383,511	6,062,860	6,740,979	6,266,417	11
Ditto . . . difference	686,833	677,722	774,328	579,514	12
Coke produced per ton of coal . . . in pounds	1606·08(*c*)	dry 1590·4	dry 1590·4	Not given	13
Ammoniacal liquor produced per ton of coal, in gallons, 10-oz. strength	40·76	39·6	31·7	,, ,,	14
Ditto . . . in pounds	418·00	405·9	324·9	,, ,,	15
Tar . . . . in gallons	16·00	17·2	13·3(*d*)	,, ,,	16
,, ... in pounds	not given	185·1	148·8	,, ,,	17
Total of solid and liquid products per ton in pounds	2196	2181	2064	,, ,,	18
Gross observed calorific value per ton of dry coal	7,469,988	7,017,784	7,597,358	..	19
Net observed calorific value per ton of dry coal	6,744,331	6,312,191	6,814,576	..	20
Net observed calorific value per ton of coal substance	..	6,803,793	7,045,337	..	21
Gross observed calorific value per ton of coal substance.	..	7,564,338	7,854,627	..	22
Crystallized sodium ferrocyanide per ton of coal, pounds	..	5·5	5·3	..	23
Sulphur in gas purified with oxide, grains per 100 cubic feet . . .	..	37·5	20·8	..	24

(*a*) Certified by Mr. Blundell that a similar coal distilled in horizontal retorts gave 10,510 cubic feet per ton, illuminating and calorific values not stated. (*b*) Ditto about 10,000 cubic feet. (*c*) Not stated whether dry or moist. (*d*) On page 166 of the "Journal" for July 20, 1909, this figure is given as 12·3; but the total yield (795 gallons) from 59·75 tons of coal works out to 13·3 gallons.

of general application, and not as a judgment upon the systems of carbonizing immediately concerned. On the contrary, Messrs. Samuel Glover and John West are to be congratulated upon the good work they have done for the gas industry, and upon the readiness with which they have placed the results of tests at the service of the profession. From these tests, published in the "JOURNAL" for the 8th of June (p. 635) and for the 20th of July (p. 166), the following figures have been culled or calculated by the writer; and they show what further particulars are required before one can make a definite affirmation as to the results the St. Helens vertical retorts are capable of yielding.

Probably the best method of examination to follow will be, firstly, to set out upon a common basis the data available; secondly, to form a balance-sheet for each ton of coal; and, thirdly, to dissect each item that forms the balance-sheet, and see how far it is supported by collateral evidence.

BALANCE-SHEET CONSIDERATIONS.

Of the tests in Table I. it is only possible to make out a balance-sheet for those in columns 1, 2, and 3. For column 4 there is no analysis of gas, and other details are lacking; while for the horizontal retorts absolutely no comparison can be made. The data for column 1 are incomplete; but an approximate result can be attempted. As to this test, it is not stated whether the weight of coke recorded was for the moist or dry condition; but if it represents moist, and we assume 4 per cent. of water, as was found in test No. 2, then it would be proper to deduct 64 lbs. from the apparent surplus shown in the Table II. The specific gravity of the tar in this test is not given; but in No. 2 test it was 1·076 and in No. 3 test 1·119. If we take the lower figure, equal to 10·76 lbs. per gallon, we obtain for the 16 gallons 172·16 lbs. as in Table II. For none of the tests is it stated how much water was added in the scrubbers or washers to remove the last traces of ammonia; but if we assume the normal figure of 10 gallons per ton, we must deduct 100 lbs. from the figures of Table I. to give those of Table II.

TABLE II.—*Weight of Products Returned per Ton of Coal Distilled.*

Column in Table I.	1	2	3
Density of gas computed from analyses (hydrogen = unity)	5·7745	5·8735	5·42335
Weight of gas from one ton of coal, pounds	361·92	357·78	378·10
,, coke ,, ,, ,, ,,	1606·08	1590·40	1590·40
,, ammoniacal liquor ,, ,,	318·00	305·90	224·90
,, tar ,, ,, ,, ,,	172·16	185·07	148·80
,, products ,, ,, ,,	2458·16	2439·15	2342·20
Apparent surplus ,, ,, ,, ,,	218·16	199·15	102·20
Weight of tar per ton of coal substance, in pounds	..	207·69	155·52
Weight of gas, do.,	..	401·50	395·10

This comparison brings out some valuable information. Firstly, that the products declared in each test exceed the weight of material employed—ranging in excess from 4½ to nearly 10 per cent.; and as we are told that no steam was admitted to the retorts, and that scarcely any water gas was produced from the seals at the coke chamber, we are left in doubt as to the origin of the apparent surplus. It is worthy of note that the latest test (No. 3) shows only about one-half the surplus of the earlier ones. There is a falling off in ammoniacal liquor, which, however, is almost accounted for by the reduced percentage of moisture in the coal, and so does not help to clear up the discrepancy. The falling off in weight of tar is not easily intelligible, especially as the coal used contained less ash as well as less moisture. The disparity is best seen by comparing the weight of tar produced per ton of coal substance. Secondly, that though the volumes of gas produced in tests Nos. 2 and 3 were respectively, 11,448 and 13,102 cubic feet, yet the weight thereof per ton of bulk coal varied only from 358 lbs. to 378 lbs.; the 14·5 per cent. increase of volume being coincident with an increase of only 5·6 per cent. by weight, while per ton of coal substance the figures become 12,847 cubic feet and 13,693 cubic feet respectively, and for weight of gas the order of magnitude becomes reversed—viz., 401·5 lbs. and 395·1 lbs. respectively. Thirdly, along with Table I. line 22, we see that, despite the adverse influence of the excess moisture and ash in the coal of test No. 2, the gross calorific value per ton of coal substance was but 3·8 per cent. less; while the illuminating value of the gas was only 1·6 per cent. less—41,829 and 42,614 candles respectively. Further, as the figures refer to the illuminating power, when the carbonic acid is left in the gas it is desirable to know what would have been the result if it had been eliminated. The illuminating powers per cubic foot would have become probably 3·532 and 3·252 respectively, giving per ton of coal substance 45,375 and 44,529 candles respectively, or nearly 2 per cent. in favour of the coal substance of the Orrell nuts. The figures available are not sufficient for definite conclusions, but with a calorific value (gross) of 3·8 per cent. in favour of the Durham coal substance, and with an illuminating value of 1·9 per cent. against it, there is not a wide disparity under distillation. There is, however, the indication of the possibility of dry, clean Arley coal proving as good as, if not better than, Thornley coal, and with that would come a higher yield of gas in the St. Helens verticals, because it could be utilized fresh from the local collieries. Fourthly, the weight of coke produced appears high, but there are no means of estimating how much it is in excess of the true value. It would have been an advantage if the percentage of ash in the coke had been given and also a determination of the volatile matter remaining, if any. Fifthly, the weight of gas given in Table II. has been computed from the analyses; but test No. 2 is the only case where more than one analysis is given. So that some uncertainty must exist as to the weights given, due partly to this cause and partly to another—the density of the unsaturated hydrocarbons—that will appear in the succeeding section of this article.

ANALYSES.

Lines 7, 8, and 9 of Table I. contain the observed calorific values of the gases in the several tests, and the figures for Nos. 1, 2, and 3 show a uniformity in the difference figures, 58·3, 59·2, 59·1, which is noteworthy in contrast with that of test No. 4, which is 50·17. The last-named is unusual for a coal gas of the gross calorific value 592; and it would have been useful to have been able to check it by an analysis of the chemical compositions. As the published results do not contain such data for No. 4, we must be content to see what the analyses given for Nos. 1, 2, and 3 have to convey as to the calorific values thereof. They raise questions that concern the validity of the data set forth in Table I., and cannot therefore be ignored.

TABLE III.—*Comparison of Analyses of Gas Made in Vertical Retorts at St. Helen's.*

Test, Column in Table I.	1.	2.	3.
Analyst	J. E. Blundell	H. G. Colman	H. G. Colman
Which analysis here given	The only one	Average of three	An average, the only one given
Methane	33·57	31·97	29·05
Hydrogen	50·94	50·67	54·70
Carbon monoxide	7·20	9·90	8·70
Simple combustibles	91·71	92·54	92·45
Complex combustibles, C_nH_m	2·80	2·70	2·85
Total combustibles	94·51	95·24	95·30
Oxygen	0·00	0·00	0·05
Nitrogen	3·49	2·73	3·20
Carbon dioxide	2·00	1·97	1·00
Total accounted for	100·00	99·94	99·55
Ratio of total hydrocarbon volume to hydrogen volume	0·714	0·684	0·583
Illuminating power of gas, containing CO_2, per cubic foot in the No. 2 "Metropolitan" burner—corresponding to the above analysis	3·148	3·274	3·112
ditto ditto CO_2 out	3·428	3·550	3·252
Observed calorific values, corresponding to the analyses in B.Th.U. per cubic foot—			
Gross	600·25	587·93	573·6
Net	541·94	531·97	514·5
Difference	58·31	55·96	59·1

TABLE IV.—*Values Calculated from Analysis.*

Test No. 1 (Mr. J. E. Blundell).	Gross.	Net.	Difference.
Methane . . 1008–902 B.Th.U.	338·38	302·80	35·58
Hydrogen . . 325–272 ,,	165·55	138·56	27·01
Carbon monoxide . . 323 ,,	23·25	23·25	0·00
Simple combustibles . . ,,	527·20	464·61	62·59
C_nH_m by difference . . ,,	73·05	77·33	+ 4·28*
Observed values . . . ,,	600·25	541·94	58·31
C_nH_m per cubic foot calculated from the above C_nH_m by difference	2609	2762	+ 153

How far the number of tests made is adequate cannot be discussed, because only in test No. 2 is more than one recorded. But it is important to notice that in Table III., test No. 2, the figures are the average of three analyses, each one of which is discussed in detail later. The observed calorific values given in Table III. correspond to these analyses, while the observed calorific values in Table I. are the averages of eight sets of observations. No serious difference occurs in the gross value between these two sets of figures, but there does in the case of the net values. Correcting some minor errors of computation in the original report, the following are the averages of the eight sets: Illuminating power with CO_2 in, 3·255 candles per cubic foot; calorific values, 588·09, 529·55, 58·54 gross, net, and difference respectively. Why the observed net value should be higher in Table III. than in Table I. is probably explained by an abnormal observation result—viz., that designated No. (3) on p. 636 of the "JOURNAL," June 8, where the gas is recorded 594 gross, 542·9 net, and the difference the abnormal 51·1. That this is in need of explanation will be apparent from a detailed examination of the analysis of this sample that follows (see Tables V. and VI.).

Table IV. shows us that the calorific values observed in Test No. 1 and those computed from the analysis are at variance, for

the difference figure of 58·31 observed is less than that which is due to the simple combustibles alone. There is no serious incompatibility between the gross values observed and computed; but the net figures are quite out of joint, and consequently the difference figure for the complex combustibles is completely reversed in sign. The simplest assumption of the cause of the discrepancy is that the condensed water from the calorimeter has been in some way underestimated. If, then, we accept the observed value for the gross to be correct, what should be assigned as the net value? We cannot, without further data, say definitely, but from analogy can indicate an approximate figure. From other sources, there is reason for believing that the complex combustibles from vertical retorts continuously charged average that of an olefine. On these lines, the C_nH_m would be $C_{3\cdot28}H_{6\cdot56}$, having per cubic foot gross, net, and difference respectively of 2607·6, 2433·76, 173·84 B.Th.U., equal for the 2·8 per cent. by volume to 73·013, 68·145, 4·868 B.Th.U. respectively per cubic foot of gas. Adding these to the simple combustibles of Table IV., we get 600·2, 532·76, and 67·45 as the gross, net, and difference. That is, the net calorific value required by the analysis is 532·76, as against the observed 541·94—a difference of 9.18 B.Th.U. Taking these figures, with the qualifications and limitations set forth, we may regard them as at least an alternative to the observed figures. Multiplying 67·45 by $6\frac{1}{7}$, we obtain as gross B.Th.U. per cubic foot (from the observed 600·25) that 414·33 are due to hydrogen and 185·92 to carbon. The last figure divided by 3·148 candles, the illuminating power of the gas containing CO_2, gives 59·06 B.Th.U. per candle; while if divided by 3·428, the computed illuminating power when the CO_2 is removed, we obtain 54·23 B.Th.U. per candle.

The disparity between the observed values for the net and difference figures and those computed from analysis, is rather larger here, in Table V. for test No. 2, than it was in test No. 1, Table IV. The reversal of the sign for the C_nH_m difference figure being from + 4·78 to − 4·61 = 9·39 B.Th.U. Taking the new difference figure, we obtain by multiplying 65·35 by $6\frac{1}{7}$, 401·43 B.Th.U. as due to hydrogen, leaving 186·50 as due to carbon; producing an illuminating power of 3·274 candles with

TABLE V.—*Average of Three Analyses by Dr. Colman for Test No. 2.*

[Marked (3), (4), and (6) on p. 636 of the "JOURNAL" for June 8, 1909.

—	Gross.	Net.	Difference.
Methane	322·26	288·37	33·89
Hydrogen	164 67	137·82	26·85
Carbon monoxide	31·98	31·98	0·00
Simple combustibles	518·91	458·17	60·74
C_nH_m by difference	69·02	73·80	+ 4·78
Average of three sets of observations	587·93	531·97	55·96
C_nH_m per cubic foot calculated from the above "C_nH_m by difference"	2556	2733	+177
C_nH_m per cubic foot computed as an olefine ($C_{3\cdot215}H_{6\cdot430}$)	2556	2385·60	−170 40
Ditto for 2·7 per cent. by volume iu gas	69·02	64·41	4·61
Total calorific value per cubic foot	587·93	522·58	65·35

the CO_2 in, and computed as 3·550 candles with CO_2 out, giving 56·96 and 52·5 B.Th.U. from carbon per candle respectively.

Reference has already been made to an accentuated case of this abnormality in analysis (3), as compared with the observed calorific values. The data for this case and for analyses (4) and (6) of the same series are given side by side in Table VI. They show a decreasing degree of discrepancy—viz., 14·51, 10·13, 3·5 respectively. These figures show the difference between the observed values for the net, and those which the analyses requires. The greatest disparity is 68·98 per analysis as against 83·49 deduced from the observed values. In order to obtain, if possible, an approximate idea of the composition of the complex combustibles the method of computation adopted in Table V. is continued here as well as in Table VII. The results thereof, when compared with the illuminating values, show a remarkable degree of consistency, and lead to the opinion that the illuminating and gross calorific values of the observations during the tests are essentially concordant. Table VII. bears out these conclusions, and yield

TABLE VI.—*Details of Test No. 2 of Table I.*

—	Marked (3) on p. 636.			Marked (4) on p. 636.			Marked (6) on p. 636.		
	Gross.	Net.	Difference.	Gross.	Net.	Difference.	Gross.	Net.	Difference.
Methane	326·59	292·25	34·34	314·49	281·42	33·07	325·58	291·34	34·24
Hydrogen	161·52	135·18	26·34	166·73	139·54	27·19	165·75	138·72	27·03
Carbon monoxide	31·98	31·98	0·00	32 30	32·30	0·00	31·65	31·65	0·00
Simple combustibles	520·09	459·41	60 68	513·52	453·26	60·26	522·99	461·72	61·27
C_nH_m by difference	73·91	83·49	+ 9·58	66·88	72·54	+ 5·66	66·41	65·48	− 0·93
Observed calorific values B.Th.U.	594·00	542·90	51·10	580·4	525·8	54·6	589·40	527·20	62·20
C_nH_m per cubic foot computed from the above "C_nH_m by difference"	2737	3092	+355	2388	2591	+203	2554	2519	− 35
C_nH_m per cubic foot calculated as an olefine	2737 $C_{3\cdot44}H_{6\cdot88}$	2554·68	−182·32	2388 C_3H_6	2229	−159	2554 $C_{3\cdot213}H_{6\cdot426}$	2384	170
Ditto for percentage by volume in gas	73 91	68·98	− 4 93	66·88	62·41	4·47	66·41	61·98	4·43
Total calorific value per cubic foot.	594 ·00	528·39	65·61	580·40	515·67	64·73	589·40	523·70	65·70
Heating power per cubic foot due to hydrogen	403			397·6			403·6		
Heating power per cubic foot due to carbon	191			182·8			185·8		
B.Th.U. per candle for gas not freed from CO_2	= 3·372 × 54·6			= 3·212 × 56·91			= 3·238 × 57·38		
B.Th.U. per candle for gas freed from CO_2	= 3·666 × 52·1			= 3·464 × 52·70			= 3·518 × 52·80		

TABLE VII.—*Test No. 3, Average Analysis (Dr. Colman).*

[Thornley unscreened coal.]

—	Gross.	Net	Difference.
Methane	292·82	262·03	30·79
Hydrogen	177·77	148·78	28·99
Carbon monoxide	28·10	28·10	0·00
Simple combustibles	498·69	438·91	59·78
C_nH_m by difference	74·91	75·59	+ 0·68
Observed calorific values B.Th.U.	573 60	514·50	59·10
C_nH_m per cubic foot computed from the above "C_nH_m by difference"	2628·40	2652·30	+ 23·90
C_nH_m per cubic foot computed as an olefine $C_{3\cdot3}H_{6\cdot6}$	2628·40	2453·10	175·30
Ditto for 2·85 per cent. by volume in gas	74·91	69·91	5·00
Total calorific power per cubic foot	573·60	508·82	64·78
Heating power per cubic foot due to hydrogen	398·0		
Heating power per cubic foot due to carbon	175·6		
B.Th.U. per candle for gas not freed from CO_2	= 3·112 × 56·42		
B.Th.U. per candle for gas freed from CO_2	= 3·252 × 53·99		

a factor, 53·99, not far removed from the 52·5 of Table V., which latter, of course, represents the average of Table VI.

Considering that a different coal is here dealt with, and that only one analysis is presented, the similarity is quite close, though at the same time it is probable that if more extensive data were available, both sets of factors would come out a little lower.

CONCLUSIONS BASED ON ANALYTICAL DATA.

Adopting, then, provisionally, the calorific values deduced from the several analyses, we are able to compile Tables VIII. and IX. The gross values of Table I. are, of course, not affected; but the net values show a diminution, and the difference figures of lines 9 and 12 of Table I. show (in the fourth column of Table VIII.) a considerable alteration in the direction of greater consistency. Taking these difference figures, I have calculated the amount of heat in each gas due to the presence of hydrogen (net) and that due to carbon; and the results are given in the last two columns of Table VIII. Extending the same method to the basis of "per ton of coal substance," Table IX. is obtained, which shows close agreement between the two coals, in the heat due to carbon; while the difference in heat due to hydrogen is not large. The last column but one of Table IX. represents the useful effect of the gases in the matter of heat, and shows a difference of less than 4 per cent. between the coal substance of the Orrell washed nuts and that of the unscreened Thornley coal when distilled in the vertical retorts of Messrs. Glover and West. As to how these figures compare with

TABLE VIII.—*Summary of Calorific Value of Gas Produced, Based on the Analytical Data.*

Cubic Feet per Ton.	B.Th.U. per Cubic Foot of Gas.			B.Th.U. per Ton of Coal Distilled.			B.Th.U. per Ton of Coal Distilled.	
	Gross.	Net.	Difference.	Gross.	Net.	Difference.	Net Due to Hydrogen.	Net Due to Carbon.
11,779	600·25	532·80	67·45	7,070,344	6,275,851	794,493	4,085,964	2,189,887
11,448	587·93	522·58	65·35	6,730,623	5,982,496	748,127	3,847,510	2,134,986
13,102	573·60	508·82	64·78	7,515,307	6,666,559	848,748	4,364,990	2,301,569

TABLE IX.—*Heat Produced by Gas from One Ton of Coal Substance, Based upon the Chemical Analyses.*

In Vertical Retorts at St Helens.	Heat Due to Hydrogen.		Heat Due to Carbon, B.Th.U.	Heat Due to Carbon and Hydrogen.		
	B.Th.U. Gross.	B Th.U. Net		B.Th.U. Gross.	B.Th.U. Net.	Difference.
No. 1 test	Not available	..	Not available	..	..	..
,, 2 ,,	5,157,260	4,317,706	2,395,900	7.553,160	6,713,606	839,554
,, 3 ,,	5,449,138	4,562,069	2,405,489	7,854,627	6,967,558	887,069

the distillation of similar coal in horizontal retorts there are not sufficient data to hand; but inasmuch as the coal in these vertical retorts remains for about 12½ hours, it will be an instructive comparison to see how the results stand with those recently given by Mr. J. Ferguson Bell for twelve-hour charges in horizontal retorts at Derby.

In the St. Helens test, as already mentioned, there are two difference figures per cubic foot that are specially noteworthy for their smallness—viz., the 51·1 in analysis (3) of test No. 2, and 50·17 of test No. 4. Judging by the results of the detailed numerical examination of the several analyses, one is inclined to consider the question as one worthy of further investigation; as it frequently happens that useful information lies behind an unusual return. If the low difference figure means that the gas in the experiments was of an unusual order, then it is desirable to know the characteristics thereof, and learn at least the carbon and hydrogen densities of the unsaturated hydrocarbons.

The following particulars, though not seriously affecting the preceding considerations, have been compiled in order to bring the collateral questions into view. They show that in test No. 1, the coal of which contained the maximum of moisture, the greatest weight of bulk coal was distilled per hour. This test, too, is credited with the lowest fuel consumption and the highest return in sulphate of ammonia.

No. of test	1.	2.	3.
Date of test (1909)	March 10 to 13.	May 20 to 24.	July.
No. of hours trial	72	96	72 (?)
Weight of coal distilled per hour, in tons	0·1059	0·09727	0·10373
Weight of coal distilled per hour, in pounds	237	218	232
Cubic feet of gas made per retort, per hour	1247	1113	1359
Coke used as fuel per 100 lbs. of coal distilled, lbs.	12·02	12·06 (dry)	12·3 (dry)
Ammonia per ton of coal equivalent to sulphate, lbs.	34 33	33·40	26·7

CALORIFIC POWER STANDARD OF THE GASLIGHT AND COKE COMPANY.

The Clauses of the Act.

A PRINT of the Act of the Gaslight and Coke Company is now before us; and, in due course, the chief features of its provisions will be noticed. Meantime, we reproduce the calorific power clauses, which naturally will have most general interest.

39. (1) As from the 1st day of January, 1910, the standard calorific power of the gas supplied by the Gaslight Company within the Gaslight district and the West Ham district shall be 125 calories net per cubic foot (the expression "calories" being used in this Act as meaning calories net per cubic foot); but the Gaslight Company shall not incur any liability in the event of their supplying gas of a calorific power of not less than 112½ calories.

(2) One testing only for calorific power shall be made at each testing-place daily; but in the event of the calorific power being on any testing ascertained to be below 112½ calories, the Gas Examiner shall forthwith give notice thereof to the Gaslight Company; and a second testing shall be made at an interval of not less than one hour from the time of making the first testing at that testing-place, and the average of the two testings shall be deemed to be the calorific power of the gas at such testing-place on that day.

40. The following provisions shall apply with respect to the testing for calorific power of the gas supplied by the Gaslight Company within the Administrative County of London, and to forfeitures in respect of deficient calorific power of such gas.

(1) If on any one day the gas supplied by the Gaslight Company at any testing-place is of less calorific power to an extent not exceeding 6 calories than 112½ calories, the average of the testings for calorific power made at such testing-place on that day and on the preceding day and on the following day shall be deemed to represent the calorific power of the gas on such one day at such testing-place.

(2) The Gaslight Company shall not be liable to any forfeiture for defective calorific power where the calorific power on any day of the gas supplied by them is not less than 112½ calories; but where the calorific power on any day of such gas is less than such last-mentioned quantity, the Gaslight Company shall be liable to the following forfeitures in respect of such deficiency (that is to say)

Where the deficiency does not exceed 3 calories, £5;

Where the deficiency exceeds 3 calories, but does not amount to 6 calories, a sum not exceeding £10;

For each complete 6 calories of defective power, a sum not less than £25, and not exceeding £100.

Provided always that the controlling authority of any testing-place having recovered one forfeiture in respect of defective calorific power in the gas supplied by the Gaslight Company at one testing-place on any day shall not be entitled to any further forfeiture in respect of defective calorific power in the gas supplied by the Gaslight Company at any other testing-place of such controlling authority on the same day. Provided also that no forfeiture shall be incurred in any case with respect to which it is certified by the Chief Gas Examiner that the defect of calorific power was occasioned by an unavoidable cause or accident.

(3) Section 10 (Company may be Represented at Testings) of the Act of 1880 shall with respect to the Gaslight Company be read, and have effect, as if calorific power were therein referred to in addition to illuminating power, purity, and pressure.

(4) Section 11 (Daily Reports and Access to Books) of the Act of 1880 shall in relation to the Gaslight Company extend and apply with respect to the testings for the purposes of this section.

(5) Section 13 (Quarterly Report of Chief Gas Examiner) of the Act of 1880 shall in relation to the Gaslight Company be read and have effect as if there were added at the end thereof: "(4) The calorific power on each day at each testing-place of the controlling authority."

(6) The provisions of Section 19 (Forfeitures and Losses from Fraud, &c.) and Section 20 (Recovery of Forfeitures, &c., 23 and 24 Vict. c. 125) of the Act of 1880 shall extend and apply to forfeitures under this section, and to the recovery thereof.

(7) The following provisions of the Act of 1905 shall extend, and apply to, and for the purposes of, the testing for calorific power of the gas supplied by the Gaslight Company within the Administrative County of London (that is to say)

Sub-Sections (1) and (4) of Section 5 (As to testing for calorific power, sulphur impurities, and illuminating power with flat-flame burner) so far as such sub-sections relate to testings for calorific power; Section 9 (Appeal by Company to Chief Gas Examiner against prescription or certification of Gas Referees); Section 10 (Sunday testing); Section 11 (Amendment of Section 12 of Act of 1880); Section 12 (Further powers to Chief Gas Examiner as to forfeiture); Section 13 (As to hearing in absence of parties); Section 15 (Penalty for neglect to comply with prescriptions of Gas Referees); Section 16 (Proceedings in case of forfeiture); Section 17 (Proof of report, &c., of Chief Gas Examiner); Section 18 (As to service of notices).

But Sub-Sections (2) (3) and (5) of the said Section 5 shall not apply for the said purposes.

(8) Section 14 (Amendment of Section 18 of Act of 1880) of the Act of 1905 shall extend, and apply to, and for the purposes of, this section as if the words "defective calorific power" had been inserted therein after the words "defective illuminating power."

41. The following provisions shall apply with respect to the testing for calorific power of the gas supplied by the Gaslight Company within the West Ham district, and to forfeitures in respect of deficient calorific power of such gas.

(1) The Gaslight Company shall within six months from the date of transfer or from the date of the provision of the testing-place (whichever shall be the later) cause to be provided at each of the prescribed testing-places within the West Ham district apparatus for testing the calorific power of the gas supplied by the Gaslight Company at such testing-place; and the said apparatus and the mode of making the tests shall be the same as shall from time to time be prescribed by the Gas Referees appointed under the City of London Gas Act, 1868, for testing the gas supplied by the Gaslight Company within the Metropolis.

(2) The Gas Examiner of the controlling authority may, at any testing-place of that authority, test, at any hour of the day or night, the calorific power of the gas supplied by the Gaslight Company at such testing-place.

(3) If on any one day the gas supplied by the Gaslight Company, at any such testing-place, is of less calorific power to an extent not exceeding 6 calories than 112½ calories, the Gas Examiner of the controlling authority shall (if the controlling authority contemplate proceeding for a forfeiture) make at such testing-place a testing of the calorific power of such gas on each of the two following days, and the average of the three testings so made shall be deemed to represent the calorific power of the gas on such one day at such testing-place.

(4) The Gaslight Company shall not be liable to any forfeiture for defective calorific power where the calorific power on any day of the gas supplied by them at any such testing-place is not less than 112½ calories; but where the calorific power on any day of such gas is less than such last-mentioned quantity, the Gaslight Company shall be liable to the following forfeitures in respect of such deficiency (that is to say)

Where the deficiency does not exceed 3 calories, £5;
Where the deficiency exceeds 3 calories but does not amount to 6 calories, a sum not exceeding £10;
For each complete 6 calories of defective power, a sum not exceeding £20.

(5) The provisions of Section 31 of the Gas-Works Clauses Act, 1871, shall apply to any testing made under this section.

(6) For the purposes of this section, Section 33 of the Gas-Works Clauses Act, 1871, shall be construed as if calorific power were therein referred to in addition to illuminating power and purity.

42. If within one month after the expiration of a period of three years from the 1st day of January, 1910, or after the expiration of any subsequent period of three years, either the Gaslight Company or the London County Council or the Mayor, Aldermen, and Commons of the City of London in Common Council assembled, shall desire that the standard calorific power prescribed by the section of this Act of which the marginal note is "Calorific Power of Gas Supplied" shall be reduced or increased, and shall give to the other parties and to the Board of Trade notice in writing of such desire, it shall be lawful for the Board of Trade, after hearing the parties, and considering any representations made to them by any of the said parties, by order to reduce or increase the amount of the said standard calorific power, and of the deficiency below such standard within which the Gaslight Company are not to be liable to forfeitures, or either of such amounts, to such extent as to the said Board may seem fit; and the said Board may, by such order, make all such modifications of this Act as may be necessary in consequence of any such reduction or increase as aforesaid, and may also direct the manner in which the costs, charges, and expenses of the said parties and of the said Board of, and incidental to, any such application and any inquiry held by, or under, the direction of the said Board in connection therewith, shall be borne.

THE AMMAN VALLEY PROMOTION.

Where the Subscribed Capital has Gone.

The past parliamentary session threw a fierce light upon the tactics of the company promoters whose operations are conducted from No. 99, Cannon Street. The *denouement* was witnessed of the plot that had for its primary object the enriching of the promoters of the Amman Valley Gas Company, to the wretched history of which we have been duty-bound to somewhat frequently draw attention. With the impudence characteristic of many of the prospectuses issued from No. 99, Cannon Street, the promoters of the Amman Valley Bill mentioned, in the preamble, that to the vendors of this rotten concern (which in time had small works, but could not supply gas, as the local authority declined to allow them to open the roads)—the vendors being one of Eaton's pieces of machinery, the Gas and Water Works Supplies and Construction Company, Limited—there had been issued, in part payment for the consideration set forth in the agreement and for other consideration, 5255 fully paid-up ordinary and preference shares and £2770 of debenture stock, to other contractors £2390 of debenture stock, and to certain creditors, as collateral security for money owing, £2720 of debenture stock. In the Bill it was asked that this £5255 of ordinary and preference shares and £7880 of debenture stock should be cancelled. The Ammanford Bill was also promoted, in order to wipe the Amman Valley Company out of existence—shareholders of the latter recognizing that, under the Eaton administration, there would be nothing but loss and trouble for them, and that the Company, through the tactics of the promoting element in the concern, would not do any good, having fallen foul of the local authority and the public generally in the district. Meantime creditors were knocking at the doors of the Amman Valley Company. In the preamble of the Ammanford Bill, it was stated that the vendors were also the contractors for the works—the Gas and Water Works Supplies and Construction Company, Limited; and this is interesting, in view of certain payments mentioned in the figures published below. The history of the year records how a Receiver was appointed in connection with the Amman Valley concern, how the promoters of the undertaking were driven into such a tight corner that the only way out of it was by withdrawing their Bill, and agreeing to sell the works at arbitration price, which will not by "a long chalk" represent the money that passed through the hands of the promoters. The amount awarded will be paid to the Amman Valley people; and they will have to satisfy their creditors, so far as they can, out of the remnant of cash that will be all there is to set opposite the subscribed capital.

One of the greatest regrets of the parliamentary session was that, through the course of events, there was no chance of getting Eaton and some of his associates into the witness chair, and eliciting from them something as to the value of the work they do in connection with these promotions, and their views as to the values of the work executed through that concern with a past—a somewhat extraordinary and unenviable past—the Gas and Water Works Supplies and Construction Company, Limited. In connection with the Ammanford Bill, Mr. E. H. Stevenson was prepared with evidence as to the value of the Amman Valley concern in relation to the payments that had flowed through the books of No. 99, Cannon Street. In his evidence before the Unopposed Bills Committee in May last, Mr. Stevenson stated that much of the money subscribed had gone, by one road or another, into the pockets of the promoters; and he gave it as his well-considered opinion that he did not believe the shareholders would ever get back a penny of their money. He had good reason for saying this, as he had in his possession the following statement as to the financial position of the Amman Valley Company at the beginning of December, 1908. In connection with the notice of the Ammanford Act in another column, it is a convenient time to publish it; and this we do with Mr. Stevenson's consent.

Statement of the Amman Valley Gaslight and Coke Company, Limited.

SHARE AND DEBENTURE CAPITAL.

Authorized share capital		£25,000
Issued to the public—		
Preference	£4,405	
Ordinary	5,592	
Vendors*—		
Preference	2,550	
Ordinary	3,505	
Total share capital issued	£16,052	

*The Vendors paid £500 cash for £500 worth, pound for pound.

Authorized debenture capital—		£12,500
Issued to the public	£3,980	
Vendors*	2,770	
Other contractors	4,410	
Other creditors as security only	1,000	
Total issue of debenture capital	£12,160	

* £2690 of this is held by the Vendors as security only for moneys advanced or owing.

RECEIPTS.

Public subscriptions—	
Shares	£9,997
Debentures	3,980
Subscribed by Vendors for shares	500
Lent Company by Vendors	950
	£15,427

PAYMENTS.

Contractors	£7,450
Buildings account	1,000
Mains purchased and laid	915
Mains purchased but not laid	570
Issue expenses	3,410
Directors' fees	170
Engineers' fees	150
Salaries	50
Debenture interest	430
Meters and stoves	300
Wages	200
Coal and coke	25
Cash proceedings to date	100
Law costs	125
Opening ceremony	25
Tools, &c., bought	100
Loans repaid	75
	£15,095

Balance must be accepted as spent on stationery, petty cash, and general office expenses.—(Signed) P. DAVIES, *Secretary*.

The tremendous sum spent on these small works, through Eaton's Construction Company, will be noted, as will also be the issue expenses for such a capital. A study of the accounts will show that Mr. Stevenson cannot be far wrong in his ominous prediction that the shareholders stand a poor chance of getting back a penny of their money.

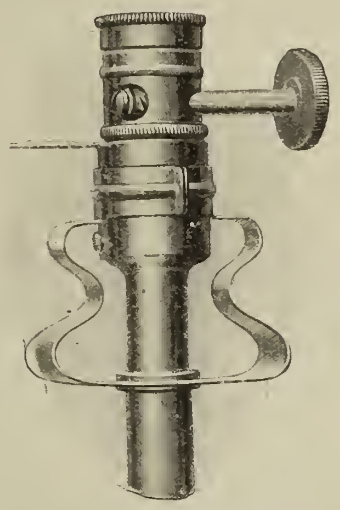
Eastern Counties Gas Managers' Association.—As was briefly intimated in last Tuesday's issue, the 42nd general meeting of the Association will be held at Hull on Thursday of this week. The members and friends will assemble at the Royal Station Hotel, where they will be entertained at luncheon by the Chairman and Directors of the British Gaslight Company. After the subsequent business meeting, there will be a dinner at the hotel. On the following day there will be an inspection of the British Gaslight Company's works and those of the East Hull Gas Company. On returning to the Royal Station Hotel, the party will be the guests at luncheon of the Chairman and Directors of the East Hull Gas Company. The *agenda* for the meeting, in addition to some formal business, includes the Inaugural Address of the President (Mr. John Young); the discussion of Mr. W. J. Carpenter's paper on "Gas Practice at Great Yarmouth," which was postponed from the last meeting; and a paper by Mr. John Holliday, entitled "Gasholder Reconstruction (a Few Notes)," which will be accompanied by a series of lantern slides showing the progress of the work from start to finish.

"AIROSTAT" INVERTED GAS-BURNER.

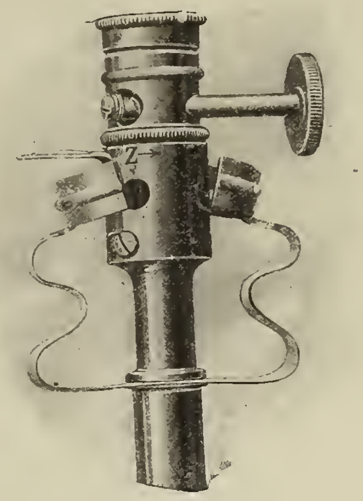
We have long since given up all idea that the ingenuity of man has reached finality in the matter of developing the efficiency of the inverted incandescent gas-burner. The comparatively small quantity of gas that is used for a given illumination, and the adjustment that is necessitated for securing the proper proportioning of the gas and air supplies, and the complete combustion of the mixture (thus realizing the highest flame intensity), has brought into use means whereby delicate regulation of the gas and air supplies is effected by hand; and inventors are constantly at work trying in the same channel to achieve greater things.

At the offices of Messrs. Julius Norden, Limited, of No. 44, Farringdon Street, E.C., a further development of the methods of regulation is shown in the new "Airostat" burner ("Degea"). The name of the burner is derived from its chief feature—that is to say, the means employed for automatically regulating the primary air supply to the burner; the automaticity being obtained by the operative action of the heat of the burner itself.

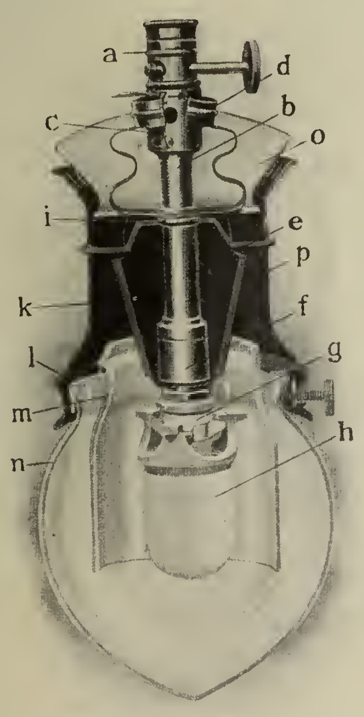
The illustrations of the bunsen tube show a pair of double-curved arms, carrying at the top clips, which, in the one case, are shown covering, although not completely closing, the air-inlets; in the other case, the clips are open, giving free entrance to the air supply. This fitting is composed of a special alloy, which in the matter of expansion and contraction is very sensitive to changes of temperature. The fitting is so made that, when the burner is not in use, and therefore cold, the clips almost close the air-holes; and, when the burner is lighted, the clips recede from the holes as the temperature increases. The main idea underlying this arrangement is that, when the burner is first lighted, and the burner and therefore the gas are comparatively cold, very little air is required for complete combustion; but, as the temperature increases, an enlarged quantity of air is required until the maximum is reached. That is the ground submitted for the chief utility of this additional device. As a matter of fact, we all know that often, when inverted burners are first of all lighted and cold, there is some little noise. But as the burner heats up, this disappears; and it is not until the burner is heated up that the proper time arrives for making the final adjustment of the air supply. Another consideration advanced is that, when an inverted burner is first lighted, if the air supply is too copious, there is danger of lighting-back; and then later, when the burner is heated up, if there is not sufficient air to ensure complete combustion, the flame smokes, there is an unpleasant smell, and the illuminating power is not what it should be. In the case of the new burner, however, the air supply is adjusted by the temperature through the little device described and illustrated. When the burner is first lighted, very little air is admitted through the holes being almost closed; but the air supply is an increasing quantity as the temperature of the burner rises, and the clips recede from the air-inlets. When the proper quantity of air is passing, as judged by the maximum illuminating power of the mantle being attained, the sliding air-collar round the air-holes (a collar provided with an arm, so that it can be readily moved when the burner is hot) can be set to that point; and then, until the burner requires cleaning, the primary air regulation will proceed automatically, no matter the temperature. During some trials witnessed with the burner, there was no noise on lighting up; and the opening and closing of the primary air-holes proceeded regularly as the burner became heated up, or as the flame was reduced, or was finally extinguished. This is another point, that the gas-flame can be turned quite low, and yet the air supply will be automatically adjusted, without interfering with the secondary regulator that is set for the gas-supply when full on with the burner fully heated up. It will also be apparent that, the clips closing the air-holes when the burner is cold, the interior of the burner is protected from dust during the whole of the many non-lighting hours. This should be of considerable advantage in mills and factories where there is a great deal of floating dust or flux through the working hours.



The "Airostat" Regulator Closed.



The "Airostat" Regulator Open.



A Section of the "Airostat" Inverted Gas-Burner.

Among the other features of the burner is a solid needle gas-regulator, which can be used to tightly close off the gas, or by it the finest adjustment can be effected. But it is impossible to overturn the regulator, as the operating shaft is provided with a strong screw-thread and stop, beyond which one is not able to turn it, so that there is no possibility of gas escaping. The needle-regulator is provided with an independent, detachable chamber, in the top of which a dust-trap is formed. The designers of this burner are also of opinion that the varying temperatures to which the mixture of gas is exposed in some types of inverted burner do not contribute to the uniformity of its illuminating power; and therefore further protection is given by surrounding the bunsen tube with a separate metallic casing, so that the temperature of the ascending products of combustion shall not disturb the mixture. The nozzle of the bunsen, which supports the mantle, is made of a special ceramic composition, and is very strong; so that there can be no deformation—the nozzle being thus kept absolutely straight with the mantle. A further feature is that the burner is fitted with an interior glass, which is supported by a simple form of bayonet joint; but, in the smallest size of the burner, this interior glass can be dispensed with, if desired. As to the outer glasses, these can, of course, be of any style, or of any degree of decoration, according to the purpose to which the burner is going to be applied. At the top of the burner, a pair of diverting wings form bilateral outlets for the escaping products of combustion, and, at the same time, prevent deterioration of the primary air supply by the latter.

The combination of the parts of the lamp will perhaps be better understood by reference to the lettered illustration of the complete lamp. In this, *a* represents the gas-regulator; *b*, the bunsen tube; *c*, the air-regulating collar; *d*, the "airostat;" *e*, the mixing-tube; *f*, enlarged extension of the bunsen; *g*, burner mouthpiece; *h*, the nozzle; *i*, bridge supporting diverters for the products of combustion; *k*, the outside casing; *l*, the inner glass holder; *m*, the inner glass; *n*, the globe; *o*, the diverter for products of combustion; and *p*, the protector for the bunsen tube.

The "Airostat" burner is made in three sizes. According to information before us, the ordinary size gives about 100-candle power for a consumption of about $3\frac{1}{4}$ cubic feet of gas; the medium size gives about 55-candle power for about $1\frac{3}{4}$ cubic feet of gas; and the dwarf burner gives about 32-candle power for 1 cubic foot of gas. These figures represent high efficiencies; but Mr. Norden particularly requests us to say the figures are approximate, and will, of course, vary according to the quality and pressure of the gas. The dwarf burner is undoubtedly economical; and the firm are putting it forward as a competitor even with the best electric lamp for domestic purposes.

These are the main features of the "Airostat" burner, which is strongly made, and, in its design, the purposes kept in view are a high efficiency, and the maintenance of that efficiency with as little trouble as possible.

A NEW COKE-DISCHARGING MACHINE.

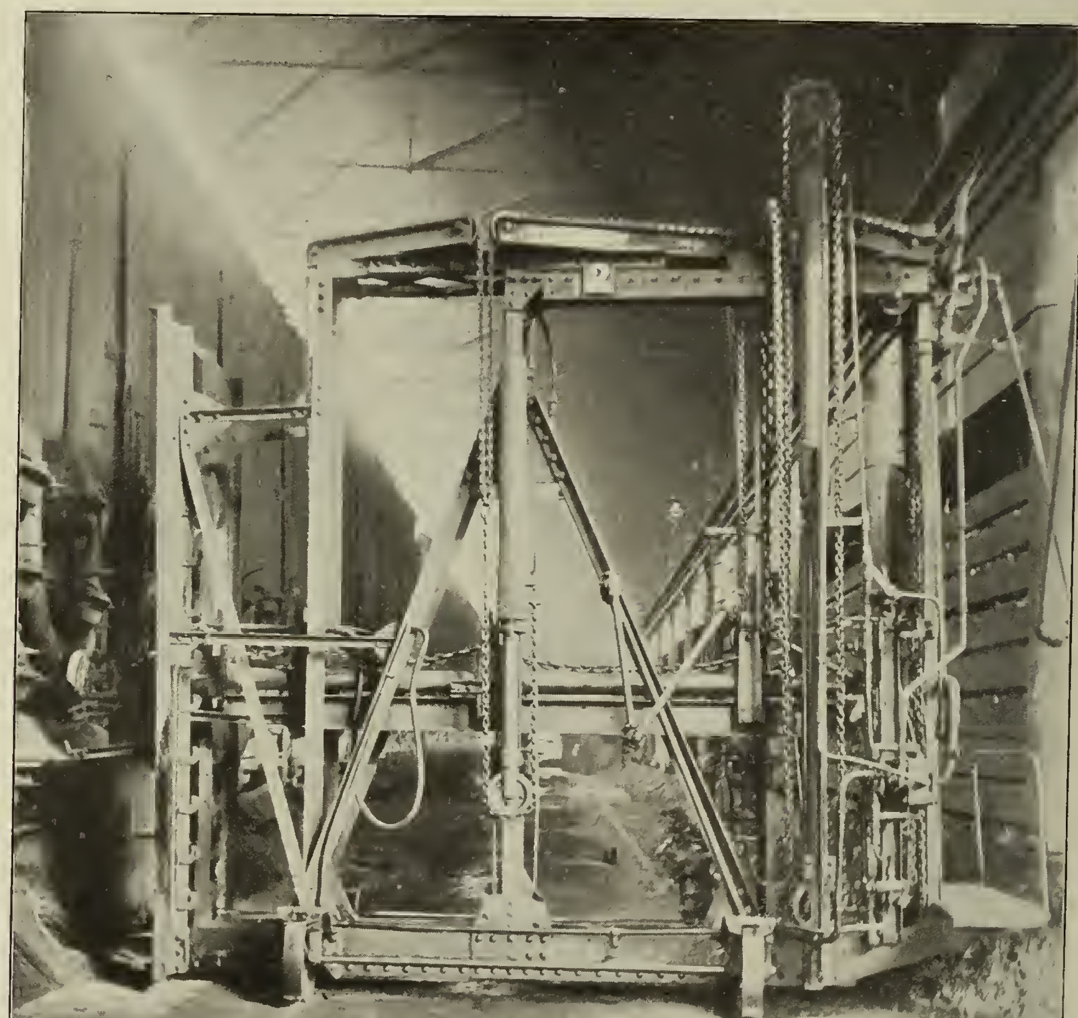
Williams' and M'Phee's Patent.

[Communicated.]

The hydraulic coke-discharging machines designed and patented by Messrs. P. E. Williams and N. M'Phee, and installed last year at the Commercial Gas Company's Poplar Works, have given unqualified satisfaction. The machines are simple in construction, powerful, and extremely reliable in their action (the wear and tear at the same time being very small); and a short description of them will doubtless be of interest.

In the accompanying photograph, it will be seen that the machine comprises a pusher, constituted of telescopic rams and cylinder secured to a beam suspended within the framework of the machine, and raised or lowered by means of the lifting ram and cylinder secured vertically to the outside of the frame. The cylinder, with drawback ram, is also attached to the framework. On the small pusher-ram is fitted a pusher-plate; and each ram is provided with a stopper at its rear end.

A special controlling valve with one exhaust and two pressure ports is provided for admitting fluid pressure to, and exhausting from, the cylinder of the pusher and that of the withdrawing ram. After the completion of the outward stroke for the purpose of discharging the coke, the pusher-rams are brought back into their original positions in the cylinder by means of a chain attached to the pusher-plate and carried over pulleys to the withdrawing ram and cylinder. On the outward stroke of the pusher-rams, the chain attached to the pusher-plate pulls in the withdrawing ram. On admitting pressure to the withdrawing cylinder, the withdrawing ram by its outward stroke pulls in the pusher-rams by the chain. Pressure for this purpose is admitted to the withdrawing cylinder automatically; and at a predetermined point of the outward stroke of the pusher, the withdrawing ram-head engaging a tappet-rod connected by a lever to the distributing valve of a small actuating ram, the stroke of which, by suitable means, reverses the controlling valve, opens the exhaust-port to the pusher cylinder and the pressure port to the withdrawing cylinder, and thus withdraws the pusher-rams. The position of the tappet on the rod connected to the lever of the distributing valve is adjusted so that the pusher completely clears the coke from the retort; but the reversal of the rams is easily effected by the man



The Williams-M'Phee Patent Hydraulic Coke Discharger Operating in the Poplar Gas-Works.

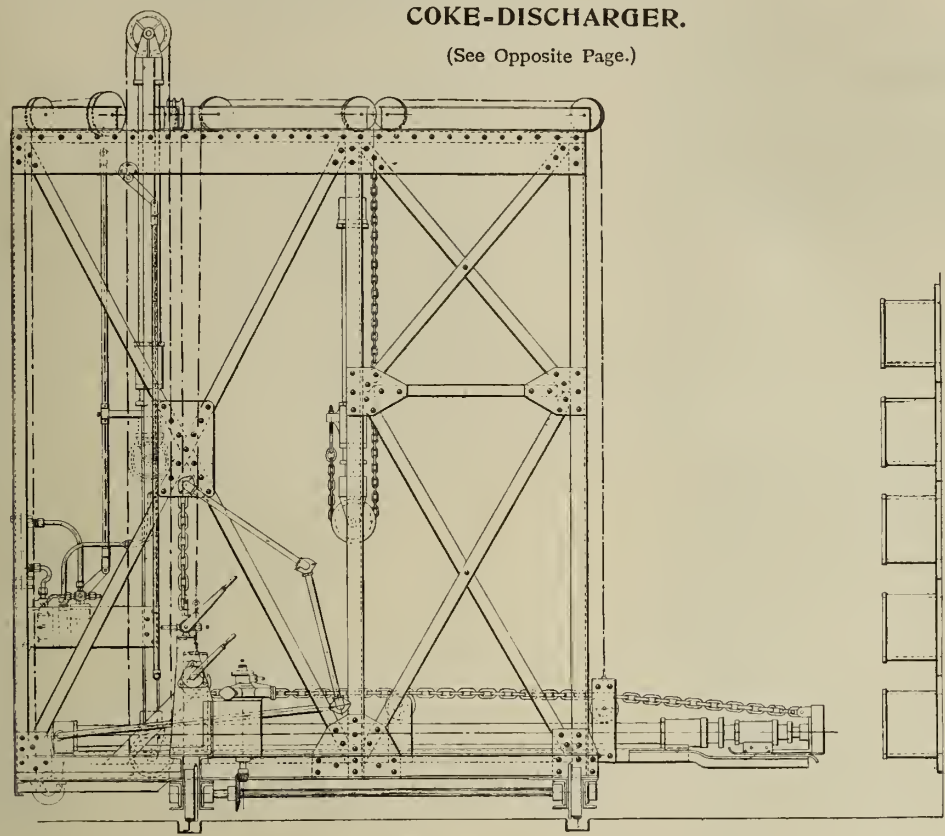
in charge, who simply raises the rod connected with the lever of the distributing valve. The chain connecting the pusher-plate to the withdrawing ram is so arranged that it automatically adjusts itself to the varying heights of the beam which carries the pusher cylinder and rams. In practical working, the outward and backward strokes are made in ten and eight seconds respectively. The machine traverses the stage by means of a three-cylinder hydraulic motor.

As an outcome of the introduction of these pushers, it has become possible to carbonize heavier charges and to increase the duration of the charge from six hours to eight hours with a nearly proportionate reduction in wages. The writer's experience has gone to prove that, with one exception, the advantages are all in favour of the use of pushers. The retorts may be practically filled with coal; and for convenience in working, an eight-hour charge has distinct advantages. The coal carbonized per retort per hour may be increased by from 8 to 10 per cent.; and the yield of gas of a practically identical illuminating power is increased from 150 to 200 cubic feet per ton. The increase in the make of gas per retort is undoubtedly due to the fact that a greater area of the heated surface of the retort is in contact with the coal. The gas is more rapidly driven out, and is consequently not subjected to the high heat for so long a period; and further proof is found in the fact of the greater freedom from stopped pipes. There is a marked improvement in the quality of the coke. The quenching of about 7 cwt. of red hot coke, which is removed from the retort in ten seconds, presents some difficulty, but can be overcome by an abundant supply of water showered over the coke for a short time. The tar is certainly less viscid, and contains 2 or 3 per cent. less water. The writer has not yet made a complete analysis of the tar; but the presence of only 3 to 4 per cent. of water is a distinct gain to the tar distiller. There is also a noticeable increase in the quantity of sulphate of ammonia produced per ton of coal.

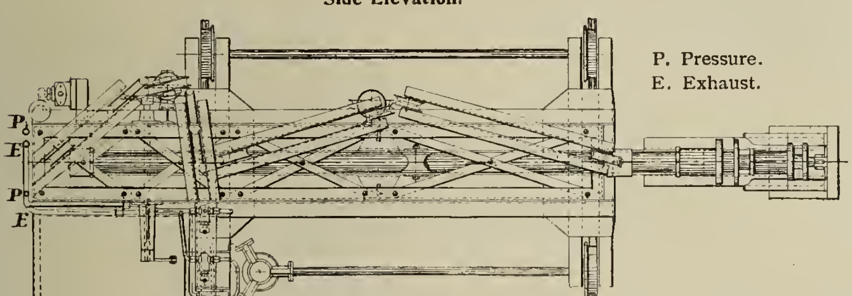
In regard to carbonizing wages, this item of expenditure has been reduced nearly 25 per cent.; and in addition to this, there is less wear and tear of stoking machinery and retorts. It has also been found expedient to pay all the workmen on the stage the same rate, and to train them to perform all the necessary duties. This system works admirably. Messrs. W. C. Holmes & Co., of London and Huddersfield, have undertaken the construction of the machines.

THE WILLIAMS-M'PHEE PATENT HYDRAULIC COKE-DISCHARGER.

(See Opposite Page.)



Side Elevation.



P. Pressure.
E. Exhaust.

Plan.

THE PARKINSON STOVE COMPANY'S NEW GOODS.

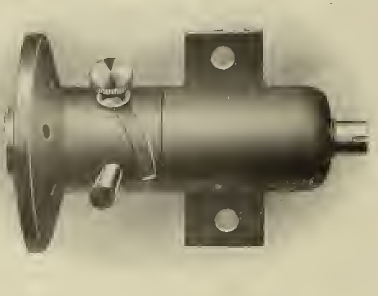
We cannot review the wide and various models in gas-fires and heaters for the coming season without calling attention to the new goods introduced by the Parkinson Stove Company, Limited, of Birmingham and London. We have had occasion previously to refer to the improvements introduced by this firm in gas-fire fuel—among other matters when their "Intense" pillar fuel was introduced; and there is no doubt they are giving a great amount of attention to this important subject. The "Intense" fuel has achieved considerable success; but an improved pattern is now being placed on the market, and owing to its special shape and general character a state of intense incandescence is quickly reached. A new pattern fuel-guard, as shown on the "Agate" fire, is supplied in conjunction with this fuel. With this, it will be noticed that there is nothing to prevent perfect radiation. Remarkable results have therefore been obtained in heating value, with the minimum gas consumption. Improvements of this type should go far to popularize the gas-fire for general use year by year; the Company's devices tending towards the reduction of gas consumption, while by means of improved fuel, &c., the efficiency of the fire is wonderfully increased. The fuel and the oval fire-front here referred to can be supplied with all single-row fuel fires when desired. The firm's gas and air adjuster has been improved for the season.

The "Intense" Pillar Fuel.

There is certainly a demand for stoves with larger fire-opening in the single-row fuel series. To meet this, the "Onyx" was introduced last year, with a 13-inch fire-front; and this is being followed now by the "Agate" fire, with a 15-inch opening. The "Intense" pillar fuel and oval guard are fitted to this design; and it is therefore a very powerful heater, and a pattern which for simplicity of design should harmonize with practically all surroundings. Modern improvements in regard to brick arrangements, &c., are included; and a duplex burner—an important adjunct—is also fitted when required. For such a stove a good market should be found; it being admirably suited for letting out on hire, and produced in good style, in various finishes.

The "Agate" Fire.

In the "Savoy," a new art stove has been introduced which has



Improved Gas and Air Adjuster.

distinctive features and is a new departure in gas-heaters. It is produced in high-class style throughout in copper, and fitted with coloured glass panels, which give a very cheerful and pleasing

The "Savoy" Fire.

effect. For the heating of shops, cafés, restaurants, halls, &c., it should supply a long-felt want, in that it will harmonize with the general decorations.

The "Thistle" Radiator.

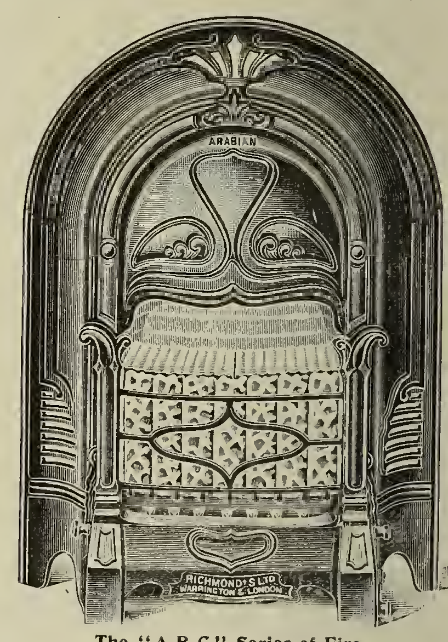
Other new patterns are introduced, including the "Thistle," a radiator on popular lines, made in various styles and finishes; and also a cast-iron ornamental back, which is very neat in appearance, and suitable for most of the firm's fires. In regard to gas-heated steam-radiators, it may be pointed out that, when required for certain positions—such as workrooms, &c.—these appliances can be fitted with a flue outlet—as originally made by the Company.

Midland Association of Gas Managers.—We are informed by the Hon. Secretary (Mr. Harold E. Copp) that the autumn meeting of the Association has been fixed for Thursday, Oct. 21, when it will be held under the presidency of Mr. W. Langford, of Longton, at the Grand Hotel, Birmingham.

RICHMOND'S GAS-FIRE IMPROVEMENTS.

No matter in what direction one looks in respect to the appliances by which gas is utilized, there are two essentials that govern from any stage further improvement, and they are experience and commercial success. The two combined stimulate to additional effort. There is the illustration of this in gas-fire production by the various makers. Looking round the show-rooms of the Richmond Gas Stove and Meter Company, improvement is seen on all hands. The old types have given place to the new, and more economical, efficient, and sightly ones. But we are principally concerned with what is seen in the "A. B. C." series of fires, which were originally introduced by the firm in 1907. The letters are the initials of the names given to the three fires—viz., "Arabian," "Bavarian," and "Castilian," which, from their introduction, have been, we learn, an unqualified success, whether for hire, hire purchase, or sale direct. One of the major commending features of this series was, and is, the interchangeability of parts, and therefore the relative smallness of the stock of parts required for maintenance purposes—that is to say, the parts of "A." are likewise applicable to "B." and "C.," and *vice versâ*. This is a feature the firm would not now on any consideration abandon. But there has been additional improvement; and the range has been extended by two further designs for larger and more important houses. The result is that the firm are in a position at the present time to offer five different designs, and fourteen different sizes, and yet only two sets of parts are needed for renewal. The hiring question is, by such provision, greatly and economically simplified.

In the main, the principal parts of the "A.B.C." series continue as heretofore. The first thing that is fresh that meets the eye is the front guard, which is more open than before, and is, as seen in the illustration, very tasteful in design. The question of the radiating power of gas-fires has been much to the fore of late; and it has been said that a certain amount of radiant heat is lost by the old close formation of the fuel guard. It is a debateable point



The "A.B.C." Series of Fire.
[Illustrating the New Guard and Fuel Arrangement.]

whether the loss is really anything very appreciable; but the fact remains that there is a fancy for seeing as much of the incandescent fire as possible, without running the risk of heated fuel falling from its position if it should become fractured or in any other way displaced. Of course, the new elongated form of fuel lends itself to the application of a more open grate; and to the extent thought desirable from the point of view of safety, the Richmond Company have made the departure illustrated.

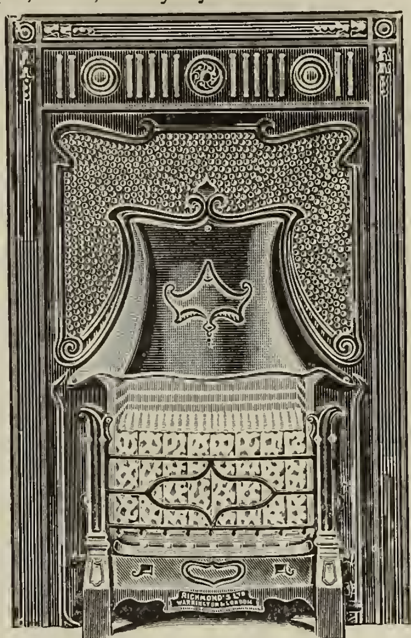
A further improvement in this series of fires is in the fuel itself and in its arrangement; and herein is seen a material acknowledgment of the suggestions emanating from the Leeds University experiments being of advantage. Last year the firm introduced a loose brick slip between the range of fuel and the main back fire-brick. By the false back, protection was given to the latter; and an increase of radiating power was also found to result from bringing the lower portion of the fire-brick backing as near as practicable to the front. In this regard, therefore, there was clearly anticipation of the fruit of independent scientific investigation. But it was also suggested that there would be further advantage by making the fuel thicker at the back and rather thinner and of more open formation at the front. This idea has been adopted; and it is found to be an aid to heat radiation from the back of the fire. Furthermore, the length of the fuel has been extended. The first step was from ball fuel to cylindrical fuel in comparatively short lengths, set upright in a row, and along the top of which were laid horizontally other pieces of the fuel. The combined height of fuel thus formed is the length

now of the single cylinders of fuel; and a row of this fuel with the loose fire-brick back constitutes all the packing of the fires with one exception, which really gives a finish to the fuel, offers an obstruction to cold currents of air playing on to the radiating portion of the brickwork and the fuel, and in a measure acts as a deflector and heat retainer. The exception is constituted of two solid pieces of fire-brick, forming a crest to the loose fire-brick back and the fuel. The illustration will show the finish that these give to the fire surface. The old idea was to shape the fire-brick back with a projecting part overlapping the fuel. With the shallow fire, the fashion in this regard was not feasible, owing to the check it gave to the escape of the products of combustion. The alteration assists in rendering a greater proportion of the heat useful; for it is quite apparent that any conservation of top heat must usefully assist the bottom heat. The experiments made by the firm show that the change is efficacious in the better heating results secured; and yet there is, through the formation of the upright fuel, no check to the escape to the flue of the products of combustion.

The "D" Fire, showing the Large Heat-Retaining Canopy.

These fires are made with 10 and 13 inch wide fire fronts. But, by the changes effected, the heating surface is increased by about 1 inch in height; and therefore, the front heating surface is, according to the width dimensions of fire, increased in area by 10 or 13 square inches, as the case may be. The importance of this is evident, in view of the fact that the consumption of gas is not increased. There is one other point about the fuel. The face of the false fire-brick back is so curved that each length of fuel stands in its own curve; and so cannot shift from its perpendicular position over its own burner. The burners, by the way, have rectangular nozzles; and so give a flat flame. The fuel is supported well above the flames; and there is an unimpeded flame direct up each piece of cylindrical fuel. One of the fires seen alight was giving a clear incandescence; and when sitting some distance from it, there was no mistaking the high degree of radiating effect. With the 13-inch size fire, the consumption of gas is about 25 cubic feet an hour at 2 inches pressure; and with the 10-inch fire, about 19 to 20 cubic feet. The gas and air adjustment has not been altered, as it is believed by the firm, after considerable tests, to be as perfect as it is possible to make it. It will be remembered that the gas and air adjuster is fitted inside the fender; and, to get at it, one has to put one's hand underneath the front of the stove. If the air-inlet were outside the fire, of course cold air would be drawn in; but, by having the inlet inside the fender, and in close proximity to the burner and flame, it is to all intents and purposes confined in a heating-chamber, and so ensures the preheating of the gas and air before entering the mixing-chamber. Another point about the "A.B.C." series. The side boiling burner is found most popular; and its presence is beneficial from the gas consumption point of view.

The same series of fires has been extended by "D" and "E" patterns—designed specially for placing in tiled recesses, or in fireplaces with tiled side panels. The heating features are the same as in the types already described; but, in other respects, they are higher class and more ornate fires for harmonizing with superior surroundings. The "D" fire is made in two sizes; and it has a curved overhanging canopy. The object in this particular fire is to retain the ascending heat in the canopy as long as possible—longer, at any rate, than is possible in a shallow cased fire. In the interior of the canopy, there are studs and hollows, which all afford (as it were) storage for heat; and the result is an extraordinary heating power, which makes the fire suitable for large rooms—such as dining-rooms. The design itself is very striking. In the "E" pattern, we have a handsome fire fitted with a cast-iron back, to put into ordinary fire-places; and this back is preferably finished in antique copper (it can, however, be had in other styles) which does not lose its appearance owing to the heat arising from the fire—an inner canopy protecting against that. The fire has a removable canopy, so that it can be made of copper, brass, or any style to meet the user's taste.



The New "E" Fire.

In addition to the "Porcellanite" colours, all the fires described can be had in art black, steel finish, or antique copper. Regarding the "Porcellanite" enamels, the range of colours has been extended to a dozen and more; the new colours being cream, crimson, old rose, and deep salmon. The cream replaces the white. It is warmer looking, answers all the purposes of white, and does not lose its pristine beauty. The crimson is very attractive. The colour is one the firm have long been trying to attain; and, after considerable experimenting and expense, they have succeeded. The old rose and deep salmon colours are also charming, and will find place in highly decorative apartments.

One or two other points for which special attention is claimed. A new heater is the "Radian" tubular stove, which has a patented air attachment, and gives a high efficiency. This is made in sections; and the object of its design is to get as much thermal duty as possible from the gas consumed prior to the escaping products passing into the flue—the construction being of a character that the cold air is drawn into the stove in such a manner as to be entirely free from contact with the heated interior surface of the stove and the gas itself. The heat travels up one leg across the top and down the other side, and away to the flue; but between the tubes, and forming part of the casting, there is a passage way for cold air, which, flowing up the heated way, has its temperature considerably raised.

PERSONAL.

The position of Chief Distributing Engineer to the Oriental Gas Company (Calcutta), recently advertised in the "JOURNAL," has been filled by the appointment of Mr. L. M. SNELGROVE, of Bradford; and Mr. C. C. BONE, now with the Commercial Gas Company, will act as his Assistant. Mr. Snelgrove, it may be remembered, was for awhile with the Union des Gaz at the Milan Gas-Works—before Mr. Hovey's appointment there.

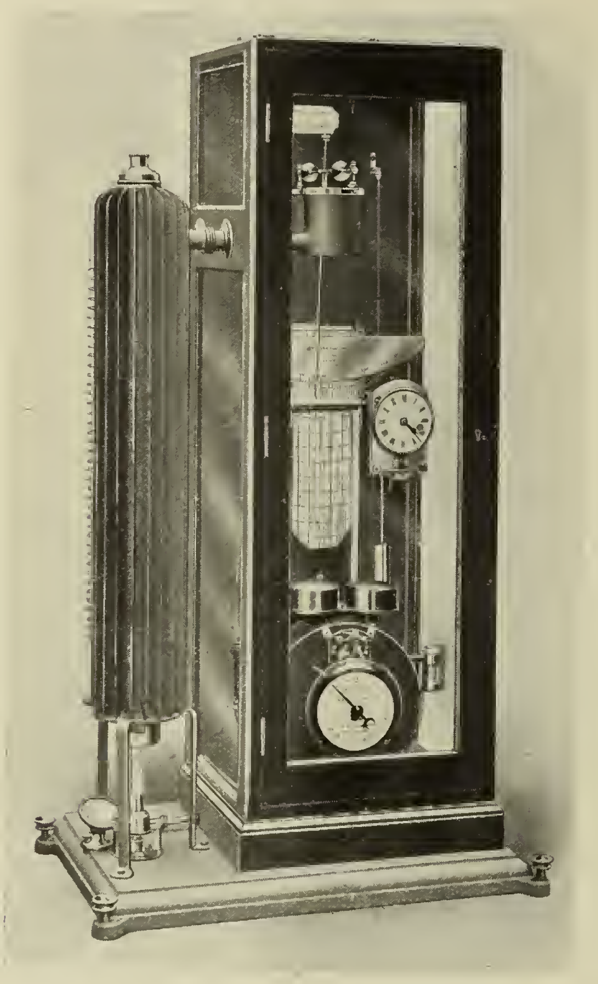
The announcement is made that Sir THOMAS E. THORPE, C.B., F.R.S., who, as was recorded in the "JOURNAL" at the time, received the honour of knighthood on the occasion of the celebration of the King's birthday last June, will shortly relinquish the post which he has held for fifteen years, of principal Chemist at the Goverment Laboratory. Among the many important positions he has occupied may be mentioned those of Professor of Chemistry at the Royal College of Science and President of the Chemical Society, of the Society of Chemical Industry, and of the Chemical Section of the British Association, as well as Vice-President of the Royal Society.

Last Tuesday, at a smoking concert, a presentation was made to Mr. E. D. WOOTTEN, Assistant-Manager at the Burslem Corporation Gas-Works, on his leaving to take up the appointment of Manager and Secretary of the Cockermouth Gas-Works. Mr. Wootten began his career at Burslem, and has held increasingly responsible positions at the gas-works there for the past fourteen years. Councillor T. Mitchell (the Chairman of the Gas Committee) presided over a large gathering, which included the officials and men of the works; and the presentation was made by Mr. Edward Jones, the Engineer and Manager. The gift consisted of a valuable canteen of table plate and cutlery containing ninety pieces. The cabinet bore the inscription: "Presented to Mr. E. D. Wootten by the officials and workmen of the Burslem Corporation Gas-Works as a token of regard and esteem on the occasion of his appointment to Cockermouth, September, 1909."

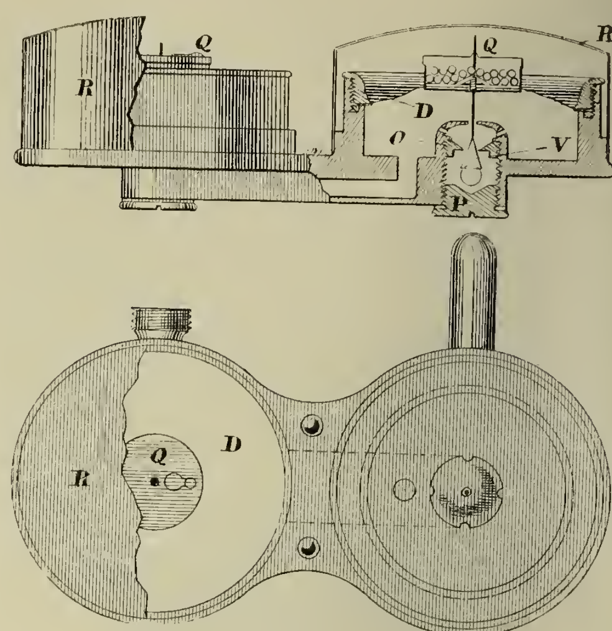
BEASLEY'S RECORDING CALORIMETER.

Description of the Regulating Apparatus.

As long ago as July 30, 1907, and again on Oct. 27, 1908 (in connection with a paper read by Mr. R. H. Bradbury before the Midland Association of Gas Managers), there appeared in the "JOURNAL" fully illustrated descriptions of the Beasley recording gas calorimeter; but Messrs. Sanders, Rehders, and Co., Limited, of No. 108, Fenchurch Street, E.C., call attention to the fact that there have since that time been certain improvements made in the apparatus—which they have named the "Sarco" gas



The Latest Form of the Beasley Recording Calorimeter.

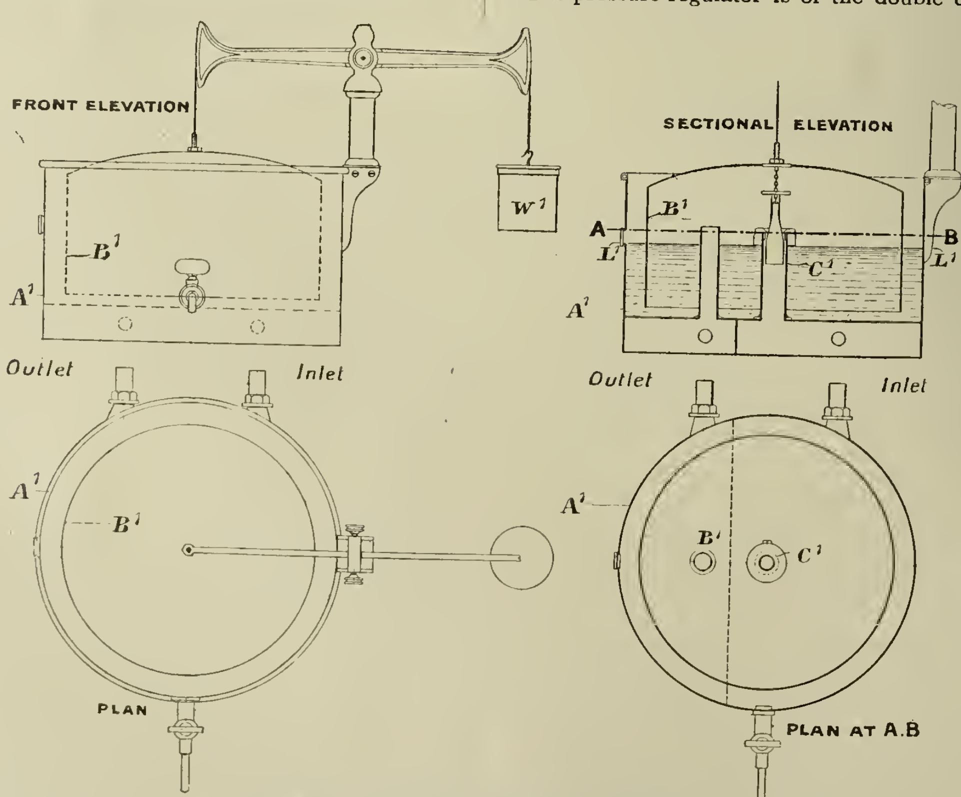


Double Dry Governor for the Calorimeter.

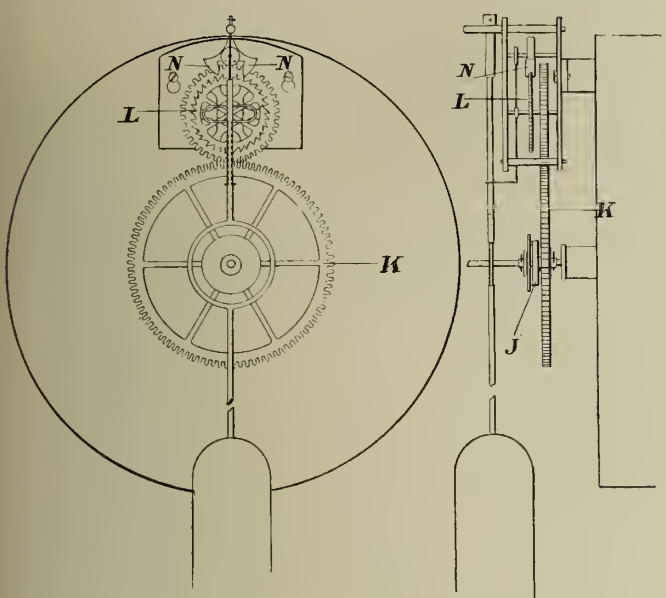
calorimeter. They have therefore forwarded the accompanying photograph of the instrument as now manufactured, together with details and drawings of the regulating apparatus. Before dealing with the latter, it may be convenient to repeat shortly the description of the calorimeter which was given in the earlier number of the "JOURNAL" referred to.

A U-shaped vessel, one limb of which is formed by the annular space between the concentric walls of a vertical chimney, is provided at the top of each limb with a small tank, and contains enough oil to fill the annular space which forms a jacket surrounding the chimney, and also to partly fill the two tanks. The gas to be examined is burned in an atmospheric burner at the bottom of the chimney; and the oil in the hot limb rises to a level above that in the other limb corresponding to the increased temperature. The difference of level is therefore a measure of the calorific value of the gas, and is recorded automatically by means of two weighted floats situated in the tanks, and connected by threads to two pulley-wheels arranged upon a horizontal spindle. The spindle rotates as the floats rise and fall respectively, and operates a lever carrying a pen; the latter tracing a diagram upon a moving band of paper actuated by the clockwork, and ruled with a scale which indicates the net calorific values. The supply of paper for one week's run is wound on a spool; and by means of the clockwork, the paper is drawn over rollers passing behind a scale, and in contact with the marking-pen, to a paper guide, which is sufficiently long to allow the exhibition of about 24 hours' record. To secure a constant stream of gas to the calorimeter, it has been necessary to use a pressure-regulator, and a patent regulating test-meter.

The pressure-regulator is of the double dry type; the rise or



Balance Governor for Power-Gas Calorimeter.



Front Elevation. End Elevation.

Meter Escapement for Calorimeter.

fall of a leather diaphragm D either causing the valve-cone V to move into or away from the knife-edge seating O. Cleaning the valve-cone and seating is easily effected by removing the plug P, and if necessary unscrewing the seating. Two governors are employed; the first reducing the pressure from about 4 inches to 1 inch, and the second to about 8-10ths inch, which is the pressure required to work the regulator satisfactorily. Shot-boxes Q are dropped over the valve-wires, and rest on top of the diaphragms; and by altering the weights, variations in pressure may be obtained. The brass covers R are fitted over the governors in order to protect the leather diaphragms.

The patent regulating test-meter ensures a constant rate of flow unaffected by variation in the specific gravity or any slight frictional or pressure variation of the apparatus; for without this regulator the quantity of gas passing would be controlled by the size of the orifice whence it issues, and the pressure. The rate of flow would consequently vary with the specific gravity of the gas, and so render the record of the calorimeter uncertain and misleading. The measuring-drum of the meter is geared to a pendulum escapement. The drum of the meter drives the escapement just as the spring of a clock drives the clock; and in the same manner as a clock escapement controls the speed of the clock, so the escapement attached to this meter controls the speed of the drum.

The large wheel K is not fixed to the drum-shaft, but to a spiral spring J; the spring itself being fixed to the drum-shaft. Consequently, when the shaft rotates, the spring is first wound up, and then, upon swinging the pendulum, the wheel K, which is in gear with the escapement proper, is set in motion. The object of the spring J is to prevent the momentary stopping, caused by the escapement pallets N engaging with the teeth of the escapement wheel L being felt by the drum.

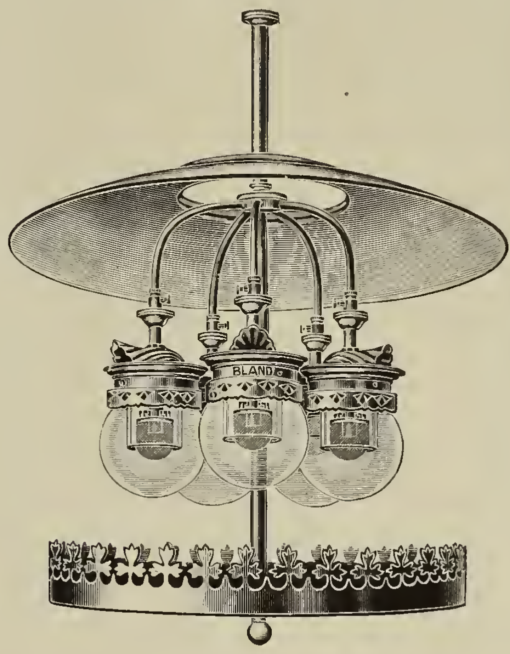
The pressure-regulator used with the producer-gas instrument is of the ordinary wet type; but the dimensions and weights of the different parts have been carefully studied to meet the present requirements. The tank A^1 is filled with water to the level L, and forms a lute to the bell B^1, from the centre of which is suspended by a light chain a somewhat heavy cone. For a normal gas pressure the bell B^1 is counterpoised by the balance-weight W^1. An increase or decrease in the pressure raises or lowers the bell, restricting the gas-passage between the suspended cone and a feather-edged seating in the chamber C^1. The bell, being large, is sensitive to very small changes of pressure; and the regulator as shown will maintain the constant pressure necessary to work the controller, and this against pressure variations from 1 inch to 10 inches in the main gas supply. This form of regulator is found to behave perfectly, even when the cone and seating have been almost covered with tarry matter from producer gas.

North of England Gas Managers' Association.—The sixty-fifth half-yearly general meeting of the Association will be held in the Crown Assembly Hall, Ocean Road, South Shields, on Saturday of next week, Oct. 2, under the presidency of Mr. T. H. Duxbury. The *agenda* includes the Inaugural Address of the President, a presentation to Mr. W. Doig Gibb, and a visit to the Oyston Street works of the South Shields Gas Company. After the meeting, members will dine together at the Golden Lion Hotel.

Association of Engineers-in-Charge.—The Council of the Association have unanimously elected Mr. Henry Adams, M.Inst.C.E., as their President, in succession to Mr. James Swinburne, F.R.S., M.Inst.C.E.; and an attractive programme has been drawn up for the coming session, including some good papers and several social functions. Among the members of the Association, Mr. Adams is one of the oldest engineers-in-charge, having as far back as 1865 been in responsible charge of the outdoor department at Armstrong's Elswick works.

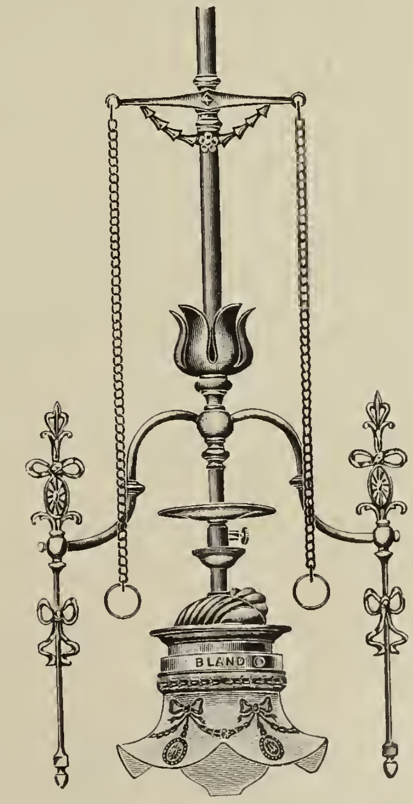
THE "BLAND" LIGHTING SPECIALITIES.

The principles underlying the large range of Bland inverted burners are well known. To the Bland Light Syndicate, Limited, credit, it should be said, is due for originally introducing certain features that have been approved, and largely adopted in burner manufacture with variations. The lateral outlet for the products of combustion—the outlet being formed by the firm's well-known shell top, which gives protection to the metal connections above and to the primary air supply—has from their very introduction been a feature of the Bland inverted lamps. So has been the use of a regulating needle-nipple for inverted burners; and so



A New Cluster Burner for Church Lighting.

has been the production of an intermediate type of burner, which is so much more suitable for a two or three light pendant for domestic purposes than the large ordinary form, in respect of gas economy, light distribution, and pleasing appearance. Another consideration advanced is that the lamps are all British made, and that they are constructed from solid brass, and are not iron



Ornate Pendants for Single Inverted Burners.

electro-brassed. To the regulating needle-nipple (which is also made of solid brass), the firm have been paying particular attention. They have been working on it to ensure that the needle shall operate positively central in the nipple hole; in order that there may be an even discharge of gas, thus ensuring a good shaped flame. This is now recognized as being an important

condition to excellent illuminating results. Touching upon the needle-nipple, too, those with large experience of the various makes have found that, in some, there is a slight leakage from the shaft by which the needle is operated; and this is apt to be unpleasant. So as to ensure against the inconvenience of this sort of thing, every nipple now sent out by the firm is tested from ordinary up to 14 inches pressure; and not one is passed that is not absolutely gas proof at this pressure. Speaking on this point, the firm know the value of a good reputation; and to maintain this, every burner, we are informed, undergoes individual examination and trial before being sent out.

As readers who have interested themselves in the many types of inverted burners are aware, the firm strongly advocate the suspension of the mantle in the globe carrier. They have experience to justify their preference. Several gas companies have testified to the fact that the cost of maintenance is most reasonable, and, in their opinion, less than the cost when the mantle is placed on the burner nozzle. The only objection is that special mantles have to be used. Suspension as provided for by the firm is credited with the merit of being a great safeguard—the points claimed being that, through the mantle resting loosely within the globe, the vibration of the burner is not transmitted to the mantle, that there is consequently great economy in mantle consumption, and that, the nozzle being brought well into the mantle, the flame is maintained in a central position. But, of course, the choice of a consumer between this method of suspension and suspension from the nozzle can be satisfied.

The firm, in addition to low-pressure burners—ordinary, intermediate, and bijou—for all conceivable lighting purposes have also high-pressure and self-intensifying burners included in their range of productions. In fact, they are making extensions in all directions to meet requirements. In the self-intensifying burner, the gallery is perforated (there is no opening in the globe); and all the air required for the feeding of the bunsen flame is drawn in through the gallery perforations, and travels down between an interior glass and the outer globe, and thus gets heated up to the prevailing temperature before reaching the flame and the mantle. With these self-intensifying lamps, every make of globe and mantle suitable for such a burner can be used. In other words, special glasses and mantles are not necessary. Another feature is that by a patent arrangement inside the bunsen tube, lighting-back is obviated; and in igniting and extinguishing the burner, there is no explosion in the mixing-chamber. The Bland-Graetzin inverted high-power lamps for both indoor and outdoor use are represented by several patterns in the show-rooms. The sizes run from one to five burners; and, the illuminating power being 125 candles per burner, the five-burner lamps will give a light of approximately 625 candles. For the South of England, the firm are also the agents for Thorp's patent combined blower and governor for high-pressure lighting. This plant is small and compact; and very suitable for mills and factories. Any form of motive power, with suitable shafting, will do for running the compressor; and a claim for it is that the constancy of the plant may be fully relied upon whether one or a thousand burners are in use. There is also an automatic arrangement, whereby, should there be a failure of the motive power from any cause, the gas will continue to pass to the burners at normal pressure. An important point when high-pressure lighting is employed in factories where fluff is flying about in the atmosphere, is to have a burner without places affording lodgment for material of the kind; and such a burner has been designed by the Bland Syndicate.

A feature is made by the firm of the lighting by inverted burners of churches and public buildings. A new four-burner cluster lamp designed for use in such buildings is illustrated. It is a handsome-looking arrangement—more so in its actual self than in the pictorial representation; and it is very powerful. These lamps can be readily attached to existing down rods; and, being furnished with a bye-pass attachment to each burner, the clusters can all of them be controlled from any distance by a separate bye-pass supply.

In fittings the firm have some exquisite patterns; and particularly noticeable are the artistic one-light pendants for inverted burners. One-light pendants are not always things of beauty; these are. Just a word as to glassware. Here, too, the firm have a choice of all forms, to suit all purposes, and to meet the most refined tastes in the matter of decorative effects. The glassware is made of "Monopel" heat-resisting glass.

GAS-WORKS EXTENSIONS AT DUNEDIN, N.Z.

Opening Ceremony.

The last New Zealand mail brings particulars of the ceremony which attended the formal inauguration of extensive alterations and improvements which have been carried out in connection with the gas undertaking of the Dunedin City Council. A tour of inspection of the new works was taken part in by a large number of people, including members of the City Council, the Legislature, the surrounding Borough Councils, and representative citizens. Mr. H. H. S. White (the Chairman of the Gas Committee) presided; and he was supported by the Hon. J. A. Millar, Mr. J. H. Walker (the Mayor), Mr. Robert English (the Engineer to the Christchurch, N.Z., Gas Company, who has acted as Consulting Engineer to the Dunedin Corporation), Mr. J. Hungerford (the Resident Gas Manager), and Mr. R. W. Richards (the Town Clerk and City Engineer).

The work consisted of a new retort-house of twelve beds of through retorts (with settings of Mr. English's own design), equipped with De Brouwer charging and discharging machines; coal-elevators; coke-conveyors and screening plant; new exhausters, of 6000 cubic feet capacity per hour; four 30 feet square purifiers; and a gasholder of a million cubic feet capacity. The foundations of the holder rest on piles driven down 75 feet. In all, 375 piles were used, the tops of which were floated in 1 foot of concrete. Upon this was placed expanded steel, upon this another foot of concrete, and then some old railway irons set in grid-iron fashion; and these were embedded in 2 feet more of concrete.

In connection with the opening ceremony there was some speech-making appropriate to the occasion. The "Loyal Toast" having been honoured,

The Mayor proposed "Success to the Gas Undertaking," coupled with the names of Mr. English and Mr. R. W. Richards (Town Clerk and City Engineer). He said that he regarded this as a red-letter day in the history of the City Corporation. During the time he had been in the Council and the four years he had been Chairman of the Gas Committee, it was his dream that he would live to see the day when these extensions were completed—extensions which in time to come would prove of great advantage to Dunedin and to the citizens. He might state that he was the sole representative in the Council at the present time who was a member when the works were undertaken; but he would like to add that they had present that day ex-mayors and ex-councillors who, during the time they served in the Council, gave these extensions their heartiest support, and who were to a large extent responsible, with others, in bringing them to a successful issue. They had been especially fortunate in this undertaking in having as their Consulting Engineer Mr. Robert English. As business men embarking on an expenditure of something like £55,000, they thought it only right and proper that they should have an expert to guide them; and they decided to entrust the work to Mr. English, of the Christchurch Gas Company—a decision they had no reason to regret. He might say there and then that the Council and the citizens of Dunedin were deeply indebted to that gentleman for the manner in which he had carried out the work from its initiation. Three years ago that day, Mr. English took charge; and he then said that, in his opinion, the works would be completed in something like three years. And what did they now find? That Mr. English was well within the limit; for the works were really completed two or three months ago. Again, they had to thank him for the works being finished for a little under the amount which he said they would cost. This, he considered, was somewhat of a record. Mr. English estimated the outlay at something like £55,000; and the works at the present time had cost a little over £53,000. He could not conclude without paying his tribute to Mr. Hungerford, in whom the citizens had a most capable Gas Engineer, and a gentleman who had not stinted himself in successfully carrying out the works.

Mr. English, in reply, said he sincerely trusted that all their anticipations in regard to the result of the working of the plant would be realized. Personally, he had no doubt they would be. They had the goods at their disposal; and he thought something should be done by the Corporation as to the selling of them—that was, in regard to distribution. He had reported fully to the Council as to what he considered should be done in this direction; and he would like to see the Council follow on the lines he had suggested, in order to show the value of gas, and how it could compete with electric light. He was certain consumers at the present time could get from three to four times better light if the burners were properly seen to. With regard to renewals and alterations, he understood that a good deal of the plant now erected had been charged to loan account. Most of this had been carried out to replace work that had become obsolete or worn out; and some method, he thought, should be adopted by which a renewal fund should be created, so that the loan money would last much longer, and would be a standing charge against revenue. He might say that during his connection with the Corporation, which was now at an end, he had received every consideration. He would like them to consider their Gas Manager, and place their confidence in him; and he was satisfied from the knowledge he had of him that if they did so they would never regret it.

Mr. Richards said his association with the Corporation, in this and every other work, had always been of a pleasing nature. He was glad to hear Mr. English speak of Mr. Hungerford in the way he had done. He hoped their Gas Manager would be given a free hand in these works. He had the capacity; it only required to be developed. They had only to give him the opportunity, and he would be a credit, not only to Dunedin, but to the whole of New Zealand. He hoped that Mr. Hungerford's past services would be recognized by reposing in him the confidence to which his position entitled him.

Mr. White, in proposing "The Gas Engineer and Staff," said that during the time he had been in the Council and a member of the Gas Committee, he had seen a good deal of the Gas Manager; and he unhesitatingly asserted that the Council had no better officer than Mr. Hungerford. He was a Dunedin boy; and they should feel proud that one of their own lads was capable of holding such an important position. He served his apprenticeship, so to speak, with Mr. English, who was recognized as a leading authority on gas matters, not only in the Australasian Colonies, but also in England.

Mr. Hungerford, in reply, remarked that it was the assistance he had received which had enabled him to discharge his duties in a manner that, he trusted, had been appreciated. He had now had control of the works for three years; and he hoped that he had discharged the duties of a somewhat onerous office in such a way as had won the appreciation of councillors—especially those to whom he was indebted for freedom of administration, which he had been fortunate enough to experience. During the execution of the works, he had been assisted by a loyal staff of workmen. The Council should continue their policy in regard to distribution of gas after its manufacture.

THE "FELD" PLANT AT EAST HULL GAS-WORKS.

In view of the forthcoming meeting of the Eastern Counties Gas Managers' Association at Hull—when the members will, on Friday, inspect the works of the East Hull Gas Company—Mr. John Holliday, the General Manager and Engineer of the works, has prepared for circulation among the members prior to the visit an account of the Feld plant he has in operation for the elimination of sulphuretted hydrogen and the recovery of the sulphur as a bye-product. Mr. Holliday has kindly forwarded a copy of this description for inclusion in this week's issue of the "Journal."

The plant consists essentially of two of "Feld's" centrifugal washers, through which the gas passing meets with a stream of washing liquor. Intimate contact then takes place, owing to the centrifugal action of the machines; the gas passing through a series of sprays of the liquor. The remainder of the plant (as shown on the diagram) is for the regeneration of the washing liquid, and the ultimate recovery of the sulphur.

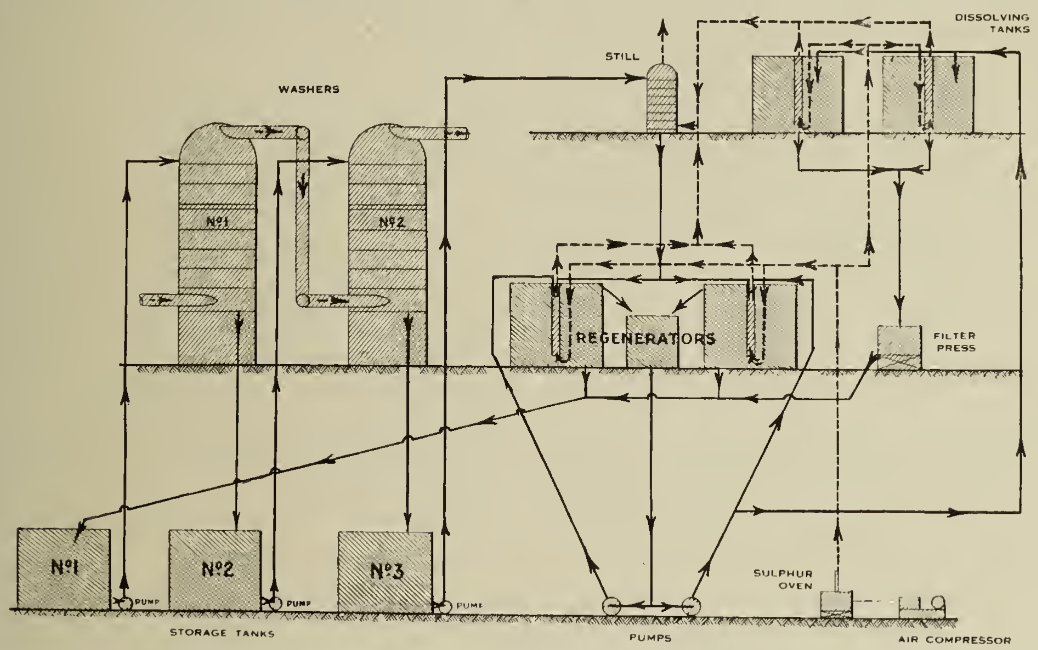
The active reagent used in the plant is zinc thiosulphate. To commence the plant, a quantity of zinc oxide is placed in one of the "dissolving" tanks, and the tank is filled with water—the zinc oxide being held in suspension by the action of mechanical agitators, with which each of the tanks is provided.

Sulphur is burnt in the sulphur oven indicated; and by passing air (from the air compressor) over it, sulphur dioxide gas is formed. This sulphur dioxide gas then passes through the dissolving tanks, meeting at this point the zinc oxide in suspension. The excess of sulphur dioxide from the tanks is passed through the "still," which is referred to later.

By the action of the sulphur dioxide on the zinc oxide, zinc sulphite is first of all formed in the "dissolving" tanks. This solution of zinc sulphite is treated in the washers with sulphuretted hydrogen from the crude gas—forming zinc sulphide. This latter again is treated in the dissolving tank with sulphur dioxide, forming zinc thiosulphate.

These reactions only take place at the first commencement of the plant. When all the zinc oxide has been acted upon—*i.e.*, converted into zinc thiosulphate (the latter being in solution)—the liquid is run into No. 1 storage tank. From No. 1 tank it is pumped into No. 1 washer, meeting the gas which is flowing in the opposite direction.

This washing liquor—*i.e.*, zinc thiosulphate—reacts with the



[The dotted arrowed lines indicate the passage of the sulphur dioxide gas; the full lines, that of the washing liquor.]

General Arrangement of the Feld Plant at the East Hull Gas-Works.

sulphuretted hydrogen contained in the gas, forming zinc sulphide and free sulphur; these two latter being present in the liquor as precipitates. [It must be remembered that zinc thiosulphate is always in excess.] From No. 1 washer, the liquor flows by gravity into No. 2 storage tank; and from this tank it is pumped into No. 2 washer, and then flows into No. 3 storage tank.

About three-fourths of the total quantity of sulphuretted hydrogen contained in the gas is extracted in No. 1 washer; the remaining portion being eliminated in No. 2 washer.

The liquor in No. 3 storage-tank now contains zinc thiosulphate, zinc sulphide, and sulphur; the former being in solution, while the two latter, as stated, are in the solid state as precipitates.

From No. 3 storage tank, the liquor is pumped into the "still," and flows from this into one of the two "regenerator" tanks. Sulphur dioxide is passed through these "regenerators," as indicated; the excess passing through the "still," and the waste innocuous gases into the atmosphere. From the "regenerator" tanks, the liquor overflows into an overflow tank; and from here it is pumped back again into the "regenerator." This operation is continued until the liquor is again ready for use.

The process of regeneration consists in converting the zinc sulphide into zinc thiosulphate by the action upon it of sulphur dioxide.

On the completion of this part of the process, the liquor is run off into No. 1 storage tank; and the cycle of operations previously described again takes place.

When the liquor in No. 3 tank contains about 15 per cent. of sulphur, it is pumped into one of the overhead "dissolving" tanks, and is here again treated with sulphur dioxide until the whole of the zinc sulphide is formed into zinc thiosulphate. The liquor, &c., is then passed through the filter press, where the sulphur is recovered in a solid form, and the filtrate (zinc thiosulphate only) flows back into No. 1 storage tank to be reused for washing the gas. This enables the sulphur to be recovered, uncontaminated with zinc sulphide.

All the various tanks are provided with overflows delivering into No. 1 storage tank; so that in the event of the attendant closing a wrong valve, no portion of the plant will be subjected to undue pressure—thus preventing accident. There is a relief-valve fixed between the air compressor and the sulphur oven for a similar purpose.

Air can be forced at will through either of the regenerators or dissolving tanks, to assist the agitation of the liquors.

Part of the sulphur recovered from the gas is burnt in the sulphur oven to sulphur dioxide, and is again recovered as sulphur during the process.

THE STORAGE OF GAS COAL.

By Herr Prenger, Manager of the Cologne Gas-Works.

Some particulars were given in the course of the report in the "Journal" for June 29 last (p. 967) of the proceedings at this year's general meeting of the German Association of Gas and Water Engineers of the paper which was presented to the meeting by Herr Prenger, the Engineer and Manager of the Cologne Gas, Electricity, and Water Works, on the Storage of Gas Coal. The paper has now been published in full in the "Journal für Gasbeleuchtung," and it will be useful to give a more exhaustive summary of its contents.

The storage of coal is a most important question for gas-works—having regard to its effect on the gas-yielding properties of the coal, and to the losses which may be incurred through spontaneous ignition. Further, it has to be decided whether capital expenditure on covered coal-stores is justified by the benefit accruing from storing the coal under cover as compared with storing it in the open. The views held by gas managers on these and cognate points relating to the handling and storage of gas coal, are so extremely divergent that it seemed expedient to the Council of the German Association of Gas and Water Engineers that an attempt should be made to collect from the managers of a large number of gas undertakings information as to their experience and views on the more important of these points. A series of questions was therefore (as already reported in the "Journal") drawn up and duly issued by the Association; and the answers

received have been placed in Herr Prenger's hands for collation with a view to a summary and a report being prepared. Herr Prenger, however, has not dealt comprehensively with the results of all the inquiries in his present paper, which is intended rather to draw attention to the diversity of views held, and to the importance of obtaining further trustworthy observations upon most of the points involved in the question of the storage of gas coal. Naturally much depends on the local conditions and on the descriptions of coal handled; and bearing this in mind it is not proposed in this summary of Herr Prenger's paper to go fully into the parts of it which have but little bearing on the storage of coal in conditions prevailing in English gas-works.

It is pointed out that the ideal state of coal supply being regulated precisely to the works' demands, no longer exists on gas-works, and that the larger gas undertakings at least must make provision for the storage of considerable quantities of gas coal. For instance, the output of the pits has, for economy of working, to be maintained at a tolerably uniform level, summer and winter; and the coal factors naturally desire gas-works to accept deliveries in the summer of more coal than is needed for their immediate use, with a view to having a surplus in hand for the enhanced winter requirements. Such equalization of deliveries demands, according to Herr Prenger, storage accommodation on the gas-works for 18 to 20 per cent. of the annual consumption of coal. Taking into account also the necessity of providing for failures of supply—owing to strikes of miners, interruptions in transport due to scarcity of railway waggons, stoppage of waterways by frost, &c.—the conclusion is drawn that storage space must be provided for from 30 to 35 per cent. of the year's requirements of gas coal. [English gas men, however, should bear in mind that Herr Prenger is basing his estimate on German conditions of coal-transport—*i.e.*, with the notorious insufficiency of waggons provided by the State railways, and with winter frosts such as are not experienced in England.] The Westphalian Coal Syndicate, moreover, offers coal generally for summer delivery at about 1s. a ton less than for winter delivery. Against this saving in cost, has to be set the loss of interest, the depreciation of the coal by storage, and the cost of handling the coal in store. These charges vary with the conditions of each works; but they must be taken into very serious consideration when a new gas-works is being erected or an old one extended—especially in relation to the question of storage in the open or in covered sheds. The latter may be provided in small works, where there is no idea of mechanically handling the coal, at comparatively low cost; but with large works this is not the case. In Germany, storage under cover is generally preferred. Out of 183 gas undertakings (many of them with more than one works) which have replied to the questions issued, 141 have wholly or mainly covered coal stores, and only 42 store their coal entirely in the open.

The risk of fire through spontaneous ignition is a very serious feature of coal storage. Notwithstanding the mass of literature on the subject, there is still great diversity of opinion as to the bearing of the depth of the stacks or heaps of coal, and of ventilation or absence of ventilation of them, on liability to ignition. Hence it is eminently desirable that every opportunity should be taken of discussing the matter, with a view to arriving at definite conclusions on these points. It may be taken as settled that the spontaneous ignition of coal is due to the rise of temperature caused by oxidation of the coal by the oxygen of the air. This process begins in the pit as soon as the coal is removed from its seam. The amount of oxygen absorbed varies with different coals; but the more it is, the greater is the chance of ignition. The danger increases with the area of the surface exposed relatively to the quantity of coal; and hence it increases with the fineness of division of the coal. When coal is stored in deep stacks, the pressure causes crumbling of the lower layers, and often fires have originated in them. But this is not the case to an exceptional extent; and statistics show that fires break out at all depths and even in shallow stacks of coal. For instance, coal has ignited at Cologne, at a spot about 3 feet below the surface, in heaps over 12 feet in depth. At other times, fire has broken out in the middle or near the bottom of the stored coal, but in all cases near the walls of the store, where, in discharging, the large coal had lodged and air had consequently readier access to the interior.

Having regard to this observation, the author believes it to be a mistake to provide ventilating passages. This view is supported by the experiences of several engineers who have found that ventilating pipes in the walls of the store favoured heating of the coal. On blocking-up these pipes, they had no further trouble from spontaneous ignition. The pipes favoured the heating-up of the coal, and acted as flues in the event of it igniting; they did not afford an energetic and uniformly distributed ventilation of the whole store of coal. Such ventilation can without doubt have good results. It has been carried out most effectively in the coal stores at Zürich and Bremen, where Saar coal is stored to a depth of 33 feet, and English coal to 20 to 23 feet, without considerable rises in temperature or ignitions occurring. The depth to which coal is stored varies greatly in different gas-works. It ranges from 10 to 30 feet for Ruhr, English, and Silesian coals, and reaches even 33 feet with Saar and Saxony coals without any very special troubles arising.

The risk of ignition is greatly favoured by the amount of dust and moisture in the coal, especially if there is also pyrites present. Quite a large amount of water closes the pores of the coal, and by protecting it from access of air reduces the danger of ignition. Moisture, however, favours the decomposition of the pyrites, and hence causes a rise of temperature, which in turn increases the capacity of the coal for taking up oxygen, so that the heating effect is cumulative and may result in ignition. It is, however, well known that the nature of the coal is of material significance. The replies to the questions issued show that fires and considerable heating of the coal are almost confined to English and Westphalian coals. In the course of twenty years 183 gas undertakings have experienced fires in only 49 works. English coal is responsible in 26 cases and Ruhr coal in 23 cases; while there have been only two fires with coal from Saxony, and one with Silesian coal. Storage in the open or under cover does not appear to have much bearing on the chance of ignition, though the former condition seems to dispose somewhat to greater risk of heating. Of the fires with English coal, 15 were with stores in the open and 11 in sheds; whereas with Ruhr coal 7 fires occurred in the open and 16 with coal stored under cover. For the avoidance of fires, it appears desirable to store coals of different origin separately, and to work off first that which is most disposed to spontaneous ignition. In the author's opinion, this ignition is due to the fortuitous co-operation of a number of different factors, such as the size of the coal, its moistness and composition, and in particular the amount of sulphur it contains. These factors vary greatly with different coals, and are also affected by the local conditions. Reports agree, however, that coal which is permeated with dust is more prone to spontaneous ignition, especially if a pocket of dust occurs in the midst of layers of lump coal through which the air can get access to it. Fires are less liable to occur with closely-packed coal or with clean screened lump coal or washed nuts.

It is also important for the avoidance of fires that the temperature of the coal in the store should be observed by means of thermometers placed in thin iron pipes inserted in the coal. If the temperature rises more than 90° Fahr., most authorities recommend the removal of the upper layers at least. Covered stores should be divided by walls into separate compartments, so as to avoid a fire spreading to a great extent. Iron columns and ties of conveying plant are said to favour the spread of fire; and they should therefore be jacketted with concrete. Dry coal only should, if practicable, be stored; and any damp coal should be used as soon as possible. The oldest coal should be used first, to avoid further depreciation. The provision of ample mechanical appliances, by which the coal in store may be quickly removed, is a great protection against serious loss through fire.

The question of the depreciation by storage of the coal for gas-making naturally affects the decision as to whether the fresh deliveries of coal should be used first, whenever practicable, and as to the length of time that coal may be kept in store. Obviously, it is desirable to avoid the cost of transporting the coal to and from the store when this is feasible. It is, however, eminently desirable that trustworthy information should be obtained as to the changes which the coal undergoes in course of storage; and this question might advantageously be taken up by the German Association's experimental works. It is, however, generally acknowledged that the yield of gas rapidly begins to diminish more or less, and that the diminution increases greatly with the duration of the storage. Thus, Grundmann has given figures, showing for Ruhr coals reductions in the yield of gas of 0·9 to over 7 per cent. on storage for only 14 days; of 3·2 to 12·0 per cent. in 150 to 160 days; and of 8·1 to 17·2 per cent. in 370 to 381 days. Experiments reported from the Konigsberg Gas-Works in 1904-5 showed the following yields of gas from New Leverson coal, in cubic feet per ton of dry coal:—

Fresh from the steamer	10,873 cubic feet.
After storage for three months . . .	10,815 ,,
,, ,, ,, seven ,, . . .	9,929 ,,

The falling off in seven months in this case, therefore, amounted to 8·6 per cent.

The diminution in value of the coke is a very important point in connection with the storage of coal. Storage of the coal reduces its caking qualities, and so renders the resultant coke small and dusty. There is also considerable decrease in heating value. In Cologne, the coke from stored coal has been found to be useless as fuel for producer furnaces, which, after being charged for three or four days with it, have to be cleared out. There is no alternative but to use coke from fresh coal. The mixing of stored with fresh coal is troublesome, and attended with some expense. A number of other gas-works have had the same experience. The coke from the stored coal naturally sells with greater difficulty, and is apt to occasion complaints. The extent of the decrease in value of the coal depends greatly on its description. Most of the returns received from gas undertakings refer to Ruhr coals. According to the particular coal used, the diminution is reported to range from 0·5 to 6 per cent. on an average make of (say) 10,765 cubic feet per ton. This is when the coal is stored under cover. After 2½ years' storage, the make is reduced by 16·6 per cent. The loss is appreciably greater when the coal is stored in the open. The figures reported range from 2 to 15 per cent., according to the length of storage. In one case, 25 per cent. reduction was found after several years' storage. The average figures for Ruhr coal stored for one year are, if in sheds, 2·1 per cent., and if in the open 5·4 per cent., falling off. Thus there is a difference of 3·3 per cent. in favour of storage under cover. For English coal, stored in the open, the loss ranges from 3 to 15 per cent., and averages 7 per cent.; while for this coal stored in sheds, the loss is between 0 and 10 per cent.—averaging 4 per cent. Several large works,

however, report that the loss in gas making value of English coal by storage is not specially great. A reliable investigation of this point seems very necessary. The results for Saar coal are tolerably concordant, and show an average loss of only 3·3 per cent. with storage in the open, and of 1·6 per cent. with storage in sheds. Coals from Silesia and Saxony show an average loss of 4 per cent. With the latter it appears to matter little whether they are stored in the open or under cover. Provisionally, the general conclusion may be drawn that it is undesirable that coal should be stored for more than a year at the outside.

Only a few observations are available on the change which coal undergoes by long storage. At Cologne, the mixture of Ruhr coal commonly used showed a falling off in calorific power, by storage for 1½ years in stacks 10 to 13 feet high, from 12,571 B.Th.U. per lb. to 11,885 B.Th.U.; while the proportion of ash in it rose from 11·70 to 12·81 per cent. The moisture fell from 3·05 to 2·26 per cent. At Quedlinburg, an increase in the proportion of ash from 10·30 to 15·47 per cent. was obtained, and a decrease in calorific power from 12,600 B.Th.U. to 11,448 B.Th.U. per lb. In this case weathering caused the moisture to rise from 2·15 to 5·09 per cent. At Düsseldorf, a falling off of 5·5 per cent. in the calorific power of the gas obtained from the coal has been found through storage of the coal; and the water in the coal has increased by 25 per cent., necessitating an increase in the expenditure of fuel for carbonization of 11 per cent. Researches made at Königsberg, reported in 1906, show quite clearly the destructive effect of great humidity of the coal when it is exposed in the open in hard winters. The moisture in the coal rose from 2 or 2·5 per cent. to 11·06 per cent. after storage for one winter, and to 13·31 per cent. after two winters; while the yield of ammonia fell from 0·222 to 0·102 per cent. of the weight of dry coal. The make of gas was diminished by 15 per cent. On the other hand, different results have been obtained at the Breslau Gas-Works with screened German coal. The make of gas fell, through storage in the open for 1½ years, from 10,909 to 10,547 cubic feet, at 60° Fahr. and 30 inches, per ton; while there was a rise in the yield of coke from 65·66 to 66·23 per cent., of tar from 4 to 5 per cent., and of ammonia from 0·317 to 0·327 per cent. The proportion of ash in the coal rose from 2·33 to 3·93 per cent. on the dry basis, while the gross calorific power of the gas made became 597 B.Th.U. in place of 592 B.Th.U. per cubic foot, and the net 536 B.Th.U. in place of 535 B.Th.U.

The following results obtained at Breslau Gas-Works with coal from the "Königin Louise" mine (Silesia) are also interesting.

Carbonization of "Königin Louise" Coal.

Condition of Coal.	Fresh and Screened Lump Coal.	Fresh but Unscreened Coal.	Weathered Through Prolonged Exposure
Ash in the dry coal, per cent.	4·22	5·12	6·07
Make of gas per ton. Cubic feet, at 60° Fahr. and 30 inches	12,032	10,817	9,026
Gross calorific power of gas. B.Th.U. per cubic foot	591	586	580
Yield per Cent. by Weight.			
Coke—			
Large	93 28	86·06	52·73
Small	4·45	8·77	18·91
Breeze	2·27	5·17	28·36
Tar	5·94	4·77	4·75
Ammonia	0·309	0·191	0·252

These figures show in particular the great decrease in the value of the coke caused by weathering of the coal.

In every case the particular conditions must be carefully considered. It must not be assumed that because machinery generally, or some particular machinery, has answered well in one works that it should therefore be adopted in another. There are limits to the economical use of mechanical appliances for handling coal; and in some cases manual labour will prove cheaper. The relations subsisting between the gas undertaking and the workmen, however, may often decide the question in favour of machinery, apart from other considerations. For large works, a coal-store equipped with machinery must always be right and economical, notwithstanding the high cost of erection and maintenance. The great convenience of electricity for driving the conveying plant, coupled with the cheapening in the cost of current to ½d. to 1¼d. per unit, must lead to its adoption for handling coal in stores. It is, however, practically impossible to compare the cost on different works of storing coal, or even on the same works when the coal is handled partly by machinery and partly by hand, because of the difficulty of separating clearly the expenses which should be charged to coal-handling and storage and those which should be included in retort-house charges.

The decision will depend on whether it is hard coal little affected by exposure to the weather or coal of which the composition and value are easily altered by weathering. At Cologne, experience had taught that it was desirable to have a covered store for the mixture of about twelve different kinds of Ruhr coal ordinarily used there. Taking interest on the capital outlay at 6 per cent., the storage under cover costs 5·4d. per ton; while the reduction in the value of the coal (thereby avoided), disregarding the deterioration of the coke, amounts to at least 6½d. per ton. There is, further, the great convenience of the handling of the coal under cover, so that the work may be carried on irrespective of weather conditions, and also the advantage that the retorts can be supplied with uniformly dry coal. Covered coal-stores are particularly valuable for works which, owing to their distance from the coalfields, pay a high price for coal, and therefore suffer greater loss through deterioration in its gas-making value.

A great deal has been written of late on the storage of coal under water. The oxidation of the coal is thus avoided, or greatly diminished. The method has been applied on a large scale in America, but chiefly to steam coal. It presents, however, obvious advantages in that it prevents deterioration through oxidation, avoids the risk of ignition, and admits of the coal being stored to any desired height without crumbling. For the latter reason, the area required for storing a given quantity can be reduced. For gas making in ordinary retorts, the coal so stored would be too wet unless it were partially dried before use. Nevertheless, gas-works which are compelled to store coal for long periods might find the method worth adopting. The choice of it must, however, be settled by the local conditions. It is satisfactory to note that the Stettin Gas-Works are about to make provision for storing under water 20,000 tons of English gas coal. The store will be on the bank of the Oder; and the coal will be transferred direct from the ship to the store. This installation should therefore afford valuable information in the course of a few years on the utility of wet storage when applied to gas coal. It must, moreover, be remembered that wet coal, direct from the store, could be carbonized without difficulty in large carbonizing chambers and vertical retorts.

The present tendency to buy coal only under guarantee of a certain calorific power, or maximum content of ash, promises to lead ultimately to washed coal being bought for carbonizing, in place of unscreened coal as won from the pits. This course will also be favoured by the adoption of vertical retorts, which carbonize damp coal satisfactorily. Trials of freshly-washed smalls, mixed with large coal, which have recently been made at the Cologne Gas-Works, have given satisfactory results.

Discussion of the Paper.

A brief discussion of the paper took place at the meeting; and a summary of the more important remarks is appended.

Herr Kordt, the Manager of the Düsseldorf Gas-Works, said that it was agreed that it was advantageous to gasify the coal when it was as fresh as possible, and at Düsseldorf 78 per cent. of the coal was carbonized without being stored. Of the remaining 22 per cent., some was stored in sheds and some in the open. Some of the latter was at times stored for 15 months. It was found that coal which had been stored for 15 months in the open showed a deterioration of 1·7 per cent. in the make of gas; and the fuel consumed in the retort-furnaces had to be increased by 10 to 11 per cent. On the basis of these figures, it had been decided not to erect covered coal-stores when the time came for extending the works, and to store coal only in the open. It had been found that the coal was more prone to heat up when stored under cover than in the open; and it was more difficult to get at the seat of the fire when the coal was in sheds.

Herr Terhaerst, the Manager of the Nuremberg Gas-Works, said that he attached great importance to the stacks of coal not being too high. The crumbling of the coal was much greater when it was stored to a depth of (say) 33 feet than of (say) 13 feet.

Mr. E. Körting, the General Manager of the Berlin works of the Imperial Continental Gas Association, said that he had found by experience that fires in stored coal could be very readily extinguished if ample quantities of water were available. In the event of fire, it was his practice to have a hole dug in the top of the heap of coal and water poured into it until it ran out from the bottom of the heap. In the second place, if the coal is discharged at the apex of the heap, the large coal runs to the outside and the small coal accumulates in the middle of the heap. It is in the small coal that fires break out. Herr Schimming, of Charlottenburg, had pointed out years ago that the coal should be spread out in layers as the heap is being built up, so that the small and large coal are not separated. By following this plan, English coal had been stored at Berlin through a whole year, in stacks 46 feet high, without firing taking place.

Dr. H. Bunte, Professor at the Technical College at Carlsruhe, said that the effect of storage on coal had already been studied to some extent at the Experimental Works of the German Association. Coal had been tested before and after being stored for a given time; but these tests referred only to a particular set of conditions. The opportunity had therefore been taken of a meeting a short time before of about 40 chemists from various German gas-works, to ask them to give special attention to the question on their own works, with a view to reporting their observations to the Association. By their co-operation information would be secured for very varied sets of conditions. A number of chemists had agreed to collaborate in making investigations—viz., Herr Eitner, of Carlsruhe; Herr Drehschmidt, of Berlin; Herr Allner, of Dessau; Herr Leisse, of Cologne; Herr Funk, of Charlottenburg; Herr Hohensee, of Saarbrücken; and Herr Leybold, of Hamburg. By the aid of these and other chemists, with the co-operation of the gas undertakings with which they were connected, it should be possible in the course of a year or two to form definite conclusions as to the effect on gas-coal of storage under various conditions.

ILLUMINATION & ILLUMINATING ENGINEERING.

By Dr. C. P. Steinmetz.

[Extracts from a Paper read before the New York Section of the Illuminating Engineering Society.]

Artificial light is used for the purpose of seeing and distinguishing objects clearly and comfortably, when the daylight fails. The problem of artificial lighting therefore comprises consideration of the source of light, the flux of light issuing from it, the distribution of the light-flux in space—that is, the light-flux density in space, and more particularly at the illuminated objects—the illumination, or the light-flux density reflected from the illuminated objects, and the effect produced thereby in the human eye. The light-flux entering the eye is varied in its physical quantity by the reaction of the eye on light-flux density in contracting or expanding the pupil. The effect of the light-flux which enters the eye is varied by fatigue, which depends on the intensity and also on the colour of the light.

The physical quantities with which one deals in illuminating engineering are therefore: The intensity of the light-source or the illuminant, and its brilliancy—that is, the flux-density at the surface of the illuminant; the flux of light, or the total power of visible radiation issuing from the illuminant; the light-flux density, or the distribution of the light-flux in space; and the illumination, or the light-flux density issuing from the illuminated objects.

The intensity of a light-source is measured in candles. Very frequently the intensity of a light-source is different in different directions, and then either the distribution curve of the light intensity is required for characterizing the illuminant, or use is made of the average of the intensities in all directions in space—called the "mean spherical intensity." The unit of light intensity, or the candle, is the intensity which produces unit-flux density at unit distance from the light-source, and thus produces a total flux of light equal to 4π units — the surface of the sphere at unit distance from the light-source. The unit of light-flux is called the "lumen," and one candle of light-intensity thus produces 4π lumens of light-flux. The light-flux is the essential quantity which characterizes the usefulness of an illuminant; and it is the raw material from which all illuminating engineering starts.

Light-flux density is the light-flux per unit area traversed by it, and is therefore measured in lumens per square metre (or square foot), just as the magnetic density is measured in lines of magnetic force per square centimetre. In illumination, use is made of the metre and not the centimetre as the unit of length. Frequently also the foot is used as the practical unit of length. For a point source of light, the light-flux density is the intensity of the light-source in candles—in the direction towards the point of observation, if the distribution is not uniform in all directions—divided by the square of the distance, in metres or feet; and the light-flux density is therefore frequently expressed in metre-candles or foot-candles. Thus at 10 feet distance from a 16-candle lamp, the light-flux density is 0·16 foot-candle, or 0·16 lumens per square foot. Very commonly, therefore, the light-flux density produced by sources of light which are not points, is also expressed in metre-candles or foot-candles, which numerically is the same value—that is, the same quantity—as lumens per square metre or square foot, but physically would refer to the equivalent candle power of the light-source.

Illumination is the light-flux density reflected from the illuminated object, and therefore is measured also in lumens per square metre or per square foot, or in metre-candles or foot-candles. Brilliancy is the light-flux density at the surface of the illuminant, and therefore could also be measured in lumens per square metre or square foot. As this unit would usually give enormous values, the brilliancy of the light-source is generally expressed in lumens per square centimetre or per square millimetre. It is a quantity which is of high importance mainly in its physiological effect.

Light-intensity, brilliancy, and light-flux are therefore characteristics of the illuminant, while flux-density is a function of the space traversed by the light-flux, but not of the source of light. With the same source of light, in the space from the surface of the illuminant to infinite distance, all light-flux densities exist between the maximum at the surface of the illuminant and zero. The brilliancy is therefore the maximum of the light-flux density. While intensity and brilliancy depend upon the shape of the illuminant, light-flux is independent thereof. Illumination is a quantity which depends not only on the source of light—that is, light-flux and flux-density—but also on the illuminated objects and their nature, and thus is the light-flux density as modified by the illuminated objects.

The light-flux, as already remarked, is the raw material with which illuminating engineering starts; and the first problem is to distribute the light-flux through space so as to give at all points the light-flux density required for satisfactory illumination. Some problems, such as the lighting of a meeting-place, school room, &c., require a uniform or general, and fairly high, intensity of illumination; while others make a uniform but fairly low illumination desirable, such as street lighting. In other cases, mainly a local or a concentrated illumination is needed. Usually, however, a combination of a local illumination of fairly high intensity, with a general illumination of lower intensity, is required. The former is used at those places where it is necessary to distinguish details; while general illumination is used merely for orientation in the space, and thus may be of lower intensity. For reasons of economy, and also for physiological reasons, the general illumination should be of lower intensity.

It is necessary, therefore, to distinguish between local or concentrated and general or uniform illumination, and a combination of both, and to distribute the light-flux in accordance therewith. That is to say, it is necessary to produce a high flux-density at the points or areas requiring high concentrated illumination, and a low and uniform flux-density throughout the remaining space. The result can be accomplished by choosing a light-source of the proper distribution curve. For instance, in street illumiuation one would use a lamp giving most of the light-flux between the horizontal and 20° below it. In many cases of indoor illumination, he would use a light-source giving most of the light between the vertical and an angle of from 30° to 60° from the vertical, depending on the diameter of the area of concentrated illumination and the height of the illuminant above it. The result can also be obtained by modifying or directing the light-flux of the illuminant by reflection or diffraction and diffusion, either from the walls and ceilings of the illuminated area, or by attachments to the illuminant, such as reflectors, diffusing globes, diffracting shades, &c. Furthermore, the required flux distribution can be secured by the use of a number of illuminants; with a larger area this arrangement is usually necessary.

Frequently, the desired flux distribution is produced by using an illuminant giving more light-flux than necessary; the excess of flux in those directions where it is not wanted being destroyed by absorption. Obviously, this arrangement is uneconomical, and represents bad illuminating engineering. The desired flux distribution should be secured economically—that is, without unnecessary waste of light-flux by absorption, which usually can be done by employing a combination of a number of light-sources of suitable distribution curves. The most economical method of securing the desired distribution curve is obviously to choose a light-source having a distribution as near to the desired value as possible, and then modifying it by reflection or diffraction.

The problem defined above is one of physics, and the result—that is to say, the objective illumination—can be measured by a photometer or illuminometer, and checked thereby. The duty of the illuminating engineer, however, does not end here; for with the same objective illumination—*i.e.*, the same distribution of light-flux throughout the entire illuminated area, as measured by the photometer—the illumination may be very satisfactory or it may be entirely unsatisfactory, depending upon whether the physiological requirements are satisfied or are violated. Very often one finds illuminations which are entirely unsatisfactory, tiring, or uncomfortable, and yet which judged by the density and distribution of the light-flux should be satisfactory. Even numerous commercial illuminants designed to give suitable distribution curves fail to do justice to their light-flux and its distribution by violating fundamental physiological requirements.

The physiological problems of illumination—that is, the effects entering between the objective distribution of light-flux in space and the subjective effects that are produced in the human eye—are, therefore, the most important with which the illuminating engineer has to deal. The first feature which must be recognized is that the objective illumination, as measured by the photometer, is no criterion of the subjective illumination—that is, the physiological effect produced by it—with regard to clearness, comfort, and satisfaction; and it is the subjective illumination by which the success of an illuminating engineering problem is judged.

The most important physiological effects are: (1) The contraction of the pupil, (2) fatigue, and (3) differences. The pupil of the eye automatically reacts, by contraction, on high brilliancy at or near the point of the retina on which is focussed the image of the object at which the eye looks, and to a somewhat lesser extent on high brilliancy anywhere else in the field of vision. If, therefore, points or areas of high brilliancy are in the field of vision, especially if near to objects at which the eye looks, the pupil contracts, and thereby reduces the amount of light-flux which enters the eye. Light-sources of high brilliancy should be arranged so that they cannot be seen directly, and the illumination should be accomplished by light reflected from ceilings, &c., or from reflectors attached to the illuminant, or the light-sources should be located where one is not liable to look at them—that is to say, at or near the ceilings.

When exposed to fairly high light-flux density, the nerves of the eye decrease in sensitivity by fatigue; and, inversely, in lower illumination or in darkness they increase in sensitivity. By exposure for a considerable period to the fairly high illumination required when working by artificial light, it appears less bright, and a higher illumination is required than would be sufficient in the absence of fatigue. In a room having a uniform intensity of illumination one is restless and uncomfortable. For satisfactory illumination, it is necessary not only to provide a sufficiently high intensity at the place where needed, but also to keep the intensity as low as permissible wherever it is not needed, so as to afford to the eye rest from fatigue. Of considerable importance regarding fatigue is the colour of the light. Fatigue at high intensities occurs far more with yellow and orange rays than with white light, and very little with green and bluish-green light. Thus, in artificial illumination, in which practically always the yellow and orange rays greatly preponderate, the question of fatigue is far more important than with bluish-white diffused daylight, and the irritating effects of fatigue are therefore mostly felt with artificial illumination.

Objects are seen and distinguished by differences in colour and in intensity of the light reflected by them. If there were no

differences in colour or in intensity in the field of vision, one would see light but would not distinguish objects. In good illumination, the differences in colour and in intensity should, therefore, be sufficiently high to see clearly by, but they should be so limited as not to preponderate to such an extent as to distract the attention from any smaller differences. Differences in colour are, however, under the control of the illuminating engineer to only a limited extent. In some cases, he can control or advise regarding the colour of objects such as the walls, ceilings, &c.; but in most cases the absolute colour of the illuminated objects is not within his control.

The main distinction of objects is due to differences in intensity or brightness. For producing these differences, shadows are of foremost assistance; and, indeed, the differences of intensity, by which objects are seen, are to a large extent those due to shadows. The study of the shadow is therefore one of the most important subjects of illuminating engineering. If there were no shadows, but a perfectly diffused illumination, even if the intensity were sufficient, the illumination would be unsatisfactory, because of the loss of the assistance of the shadows in distinguishing objects. Seeing becomes more difficult; illumination, restless and uncomfortable.

The use of shadows for illumination requires directed light—that is, light coming from one or a number of sources, and not merely diffused illumination coming from all directions. While, however, in general, perfectly diffused illumination is unsatisfactory, an illumination having only directed light is also unsatisfactory. If all the light is directed, as from a single arc lamp, the shadows are absolutely black, and one cannot see anything in them; and in attempting to see the objects in the shadows the illumination becomes tiring to the eyes, irritating, and restless. For satisfactory illumination, it is necessary, therefore, to have sufficient directed light to mark the edge of the objects by their shadow, and thereby improve the distinction; but at the same time there must be sufficient diffused light to see clearly in the shadow—that is to say, a proper proportion of directed and of diffused light is necessary.

The requirements of satisfactory illumination can be grouped in two main classes, referring respectively to economy and to comfort; the characteristics being as follows: (1) General or uniform and local or concentrated illumination, and combination of the two. This is of importance for economy; to avoid the production of unnecessary light-flux; to reduce the effect of fatigue; and to add to the comfort. (2) Diffused and directed illumination, and combinations of the two, and the theory of the shadow. This is of importance for the comfort of illumination, in securing clearest distinction. (3) Quality or colour of light, of importance in economy, to suit the colour to the intensity of illumination, and in comfort by increasing or softening the differences in colour shades. (4) Massed and distributed illumination, as controlling the distribution of the light-flux, and thereby the economy, and also the diffusion. (5) Direct illumination and indirect illumination, shaded, diffracted, diffused or reflected light, in its relation to the brilliancy of the light-source, and thereby the effect of the contraction of the pupil, on economy and comfort.

Some of the common mistakes made in illumination are: (1) Unsatisfactory proportion of general and of concentrated light. (2) Exposure of lamps of high brilliancies in the field of vision, such as naked filaments. (3) Unsuitable proportion of diffused and directed light. (4) Improper direction of directed light and the accompanying improper length of shadows. (5) Sharp edges of shadows.

Some typical cases may be considered in order to show the applications of the preceding principles.

Domestic Lighting.—Domestic lighting usually requires a combination of concentrated illumination of fairly high intensity locally at the work-table, dining-table, &c., and general illumination of low intensity, to secure comfort and economy. Occasionally, as in halls, &c., the local lighting is absent, and only general illumination is required; while in a sick-room the general illumination is absent, and only local illumination is required.

In this illumination, the proportion between directed and diffused light should be such as to give the proper effect of shadows. The problem of domestic illumination is, therefore, to produce a definite distribution of light-flux density with a definite proportion between diffused and directed light. By deviating from the proper proportion on one side, the room appears to be cold and uncomfortable; while by deviating in the other direction, it appears dark and gloomy.

The light issuing directly from a single illuminant is directed light; the light issuing from a number of illuminants is diffused by the overlap of the light-fluxes of the illuminants—the diffusion being greater the greater the number of illuminants. The light reflected from walls and ceilings is diffused light. The proportion between the light reflected from walls and ceilings and the direct light from the illuminants varies with the reflecting power of walls and ceilings—that is, with their brightness or darkness. The proportion between directed and diffused light, therefore, can be changed, and the diffused light can be increased by increasing the number of illuminants, and also by increasing the brightness of walls and ceilings. With a chosen brightness of walls and ceilings, the desired distribution of the light-flux—a local high and general low intensity—can be produced by a single illuminant having the proper distribution curve of light-flux. In this case, however, there is usually obtained too much directed and not enough diffused light. The same distribution of light-flux can be produced by using a large number of illuminants properly located—nearer together for the local than for the general illumination. In the latter case, there is obtained more diffused and less directed light; and by choosing the number of light-sources, it is possible, with a given brightness of walls and ceilings, to get the desired distribution of light-flux and at the same time obtain the proper proportion of directed and diffused light. With a different brightness of walls and ceilings, the distribution curve of a single light-source required to give the desired light-flux distribution is correspondingly changed; and the lighter the walls and ceilings, the more light is reflected to give a diffused general illumination, and less direct light is required from the illuminant for the general illumination. With increasing reflecting power of walls and ceilings, the proportion of diffused light increases, and the number of light-sources required to give the proper proportion between directed and diffused light decreases. In a room with light walls, a smaller number of light-sources is therefore required for good illumination than in a room with dark walls, assuming the same intensity of local and of general illumination.

The problem of domestic illumination, which is to obtain a certain distribution of illumination with a definite proportion between directed and diffused light, therefore leaves one independent variable—the brightness of walls and ceilings. This result is necessary, because the problem of domestic illumination is twofold—namely to get the proper illumination by means of daylight, and also to get it for artificial illumination. During daytime, the windows are the source of light—the directed light issuing from the windows, the diffused light from the walls and ceilings and by the overlap of the light from several windows. The proper distribution between local and general illumination during daytime, and at the same time the proportion of directed and diffused light, therefore determines the number of windows and the brightness of walls and ceilings, in the manner previously discussed.

As the reflecting power of walls and ceilings is fixed by daylight considerations, it can be chosen only to a limited extent by considerations of artificial illumination. As already noted, however, this result is not necessary, for the problem can be solved by using a combination of a suitable number of light-sources of proper distribution curves. To some extent—due to the different qualities of artificial light and daylight—the walls can possess a different reflecting power for the one than for the other. As artificial light is deficient in blue and green, a bluish or greenish shade of walls and ceilings gives them a greater reflecting power for daylight than for artificial light, which is usually desirable. The opposite is true with a reddish-yellow shade.

Street Lighting.—The problem of street illumination is to produce a uniform low intensity. For reasons of economy, the intensity must be low, at least in American cities, in which the length of street per inhabitant is usually many times as great as in European cities. Moreover, the same type of illuminant is usually required for the entire area of the city. The low intensity of illumination necessitates the use of the quality of light which has the highest physiological effect at low densities—that is, white light—and excludes the yellow light as physiologically inefficient for low intensities. An even better effect would be produced by the bluish-green light of the mercury lamp, which, however, is not much liked, due to its colour. The greenish-yellow of the Welsbach mantle is also quite satisfactory for these low intensities. The American practice of preferring the white light of the carbon or magnetite arc lamp is therefore correct and in agreement with the principles of illumination. The yellow flame arc lamp can come into consideration—even if it were not handicapped by the necessity of frequent trimming—only in those specific cases where a high intensity of illumination is used, such as in the centres of some large cities.

Uniformity of illumination is specially important in street lighting, where the observer moves along the street; and the decrease of subjective illumination by fatigue is especially objectionable on account of the low intensity. For a street illuminant there is required a distribution curve which gives a maximum intensity somewhat below the horizontal, no light in the upper hemisphere, and very little downward light. Street-lamps therefore should be judged and compared by the illumination given midway between adjacent lamps, or at the point of minimum intensity—in other words, by the intensity in a direction approximately 10° below the horizontal. This requirement also is in agreement with American practice. It is very important, however, that the downward intensity should be very low; and in this respect it is not always realized that the light thrown downwards is not merely wasted, but is harmful in producing a glaring spot at or near the lamp. The fatigue caused by it reduces the effective illumination at the minimum point between the lamps. In this respect the most objectionable lamp is the open direct-current carbon arc lamp; but even with the enclosed arc lamp, the distribution of light on the street surface is still far from uniform, and the intensity is too high near the lamp.

The greatest defects of the present street lighting which frequently makes it inferior in subjective illumination even to the far lower illumination given by the full moon, are the absence of diffused light, and especially the improper direction and termination of the shadows, and also the high brilliancy of the illuminant. The light of the usual street-lamp is practically all directed light issuing in a nearly horizontal direction from a point source. The shadows are thus far longer than are permissible, and they all

terminate sharply and without blurr. Objects in the shadows are practically invisible; and the end of a shadow looks like the edge of an object, thereby producing a misleading effect which results in unsatisfactory illumination. To give a somewhat better direction to the light requires considerable increase of the height of the lamp above the street surface. This change would also essentially decrease the intensity of illumination below and near the lamp, without appreciably affecting the intensity at the minimum point, and thus would give a more uniform and better illumination.

No valid reason usually exists against considerably increasing the height of the lamps, except that of the greater cheapness of short lamp-posts, which is hardly justifiable. It is more difficult to give a proper blur to the ends of shadows, so as to distinguish them from edges of objects. This would require an increase of the extension of the illuminant, by opal globe, &c. Enclosing the arc by an opal globe, however, will scatter the light more uniformly in all directions, and thereby spoil the distribution curve, and interfere with the required uniformity of illumination. With an opal globe, the intensity in the downward direction does not differ very much from that in the horizontal; while with lamps 20 feet above the street level, and at distances of 200 feet from each other, the downward intensity of uniform illumination should be not much more than 1-25th of that under an angle having a sine of $20 \div 100 = 0{\cdot}2$, or 12° below the horizontal.

The only way of maintaining a proper distribution curve and at the same time diffusing the light so as to reduce its brilliancy and blur the shadows, appears to be to use proper prismatic diffraction, on the principle of the Fresnel lenses of lighthouses. Obviously, where the lamps are close together, as in the centre of large cities, their light-fluxes overlap, and thereby give a better diffusion, and at the same time the midway point between lamps is under a greater angle against the horizontal, and therefore a more downward distribution of the light-flux is permissible. For the largest part of American street lighting, however, this remark does not apply.

In conclusion, I desire merely to emphasize the fact that it is not sufficient to arrange the distribution of light-flux so as to get the proper illumination as measured by the photometer, but that the physiological effects of the light require careful study, because they are essential in determining the effect of the lighting, and very often constitute the difference between a satisfactory and an unsatisfactory illumination.

GASEOUS EXPLOSIONS.

Second Report of the British Association Committee.*

During the session 1908-9, the work of the Committee consisted partly of new investigations and partly of study and critical discussion of English and Continental work already published. The new work has necessitated the design and construction of much new apparatus, and especially of new optical indicators. Four meetings were held in Mr. Dugald Clerk's laboratory in London, and one at the National Physical Laboratory. The five meetings were all excellently attended. Seven notes were presented and discussed:

No. 7.—The Analyses of Exhaust Gases from the Petrol Engine (W. Watson).
No. 8.—Some Experiments on Chemical Equilibrium in Gaseous Explosive Mixtures (Dugald Clerk).
No. 9.—Deville's Experiments on the Dissociation of Gases (J. A. Harker).
No. 10.—On Radiation in a Gaseous Explosion (B. Hopkinson).
No. 11.—The Alternate Compression and Expansion of Dry Air in an Engine Cylinder (Dugald Clerk).
No. 12.—Direct Measurement of the Temperature of the Working Fluid in a Gas-Engine Cylinder (W. E. Dalby).
No. 13.—The Temperatures reached in the Compression of Air (B. Hopkinson).

It will be observed that Notes Nos. 7, 8, and 9, by Professor Watson, Mr. Dugald Clerk, and Dr. Harker, deal with the question of chemical equilibrium; while No. 10, by Professor Hopkinson, though dealing primarily with radiation, also bears upon the same subject. Notes Nos. 11 and 13, by Clerk and Hopkinson, are devoted to the study of the compression and expansion of cold air within a cylinder; while No. 12, by Professor Dalby, deals with the direct determination of the suction temperature in a gas-engine when working.

Professor H. B. Dixon has continued his experiments on the ignition point of gases by two methods. In the first, the gases are heated separately before being brought into contact, and the temperature is determined at which the meeting gases enflame. The combustible gas is led up a narrow tube of glass or quartz in the axis of a larger tube heated electrically; air or oxygen passes up the space between the two tubes. The wider the tubes and the quicker the flow of gases—*i.e.*, the less the contact action of the heated surfaces on the mixing gases—the lower the ignition temperature was found to be. Experiments made between half an atmosphere and two atmospheres showed a lowering of the ignition temperature with an increase of pressure.* In the second method, the mixed gases are fired by sudden compression in a cylinder, according to Nernst's suggestion. Photographs have been taken, on a rapidly moving film, of the flames produced by adiabatic compression. The values found are lower than those given by the first method, as was to be expected from the high pressures at which the gases are fired. These experiments are being continued. Professor Dixon has also continued his experiments on the velocity of sound in different gases heated in a long tube.

Apart from the new investigations dealt with in the notes, much preparatory work has been done by many of the members. Thus Professor Dalby has refitted the engine—the subject of his experiments—with electric ignition, and arranged the end so as to take a new optical indicator; Professor Bone has made preparations to extend his well-known experiments to explosions and combustions where oxygen is present in excess; Professor Coker has improved his apparatus for studying wall-temperature changes; Professor Burstall, in conjunction with Professor Hopkinson, has made comparisons between a good mechanical indicator and the Hopkinson optical indicator; Watson, Callendar, and Dalby have devoted much study to the improvement of the diaphragm optical indicator; and Hopkinson and Clerk have improved the operation of their piston optical indicators.

In this report, the sequence of the first report will be followed as far as possible, so that the effect of the year's work will be readily apparent.

Measurement of Internal Energy or Specific Heat of Gas at High Temperatures.

No new high-temperature experiments on "volumetric heat" have been published; but attention has been devoted to the lower end of the scale, as Regnault's and other standard results were shown last year to be in need of revision. This was necessary in order to clear the ground for high-temperature work.

I.—*Constant Pressure Experiments up to 100° C.*

It was stated in the first report that the results of Regnault for the specific heat of air at ordinary temperatures which have hitherto been accepted as correct, were materially lower than those obtained by some more recent observers. Among these latter researches, the most important were perhaps those of Mr. Swann,† the results of whose experiments, which had not then been published, were communicated to the Committee by Professor Callendar, and gave values about 2 per cent. higher than those of Regnault. Mr. Swann's results have now been published, and he has supplied the Committee with a complete copy of his paper. The method employed by him had previously been used by Professor Callendar for determining the specific heat of superheated steam. A current of the gas is passed over an electrical heater, the energy supplied to which can be accurately measured, and the temperature of the gas is measured before and after passing the heater by means of platinum thermometers. The rise of temperature, which amounted to about 5° C., can be measured correctly to 0·001° C.; and an at least equal degree of accuracy is obtainable in the measurement of energy supplied. A correction of the order of 10 per cent. of the total supply of heat has, however, to be applied for the loss of heat from the gas as it passes to the thermometer. It is assumed that with a given inflow and outflow temperature of the gas, this loss of heat is independent of the rate of flow, and its amount is determined by experiments at different rates of flow.

It will be remembered that a correction, amounting to about 5 per cent., was applied in Regnault's experiments for the flow of heat by conduction along the substance of the pipe which connected his heater with his calorimeter. Regnault assumed that, with a given temperature difference, this correction was independent of the rate of flow of gas. It was pointed out by Professor Callendar that this assumption could not be justified, and that it would lead to too low a value of the volumetric heat. The corrections involved in the methods employed by Swann have been fully discussed by the author and also by Callendar. They appear to admit of determination with an order of accuracy approaching 1 in 1000 in the result. On this account, and because of the close agreement of Swann's results with those obtained by Joly, the Committee consider that there is now little doubt that Regnault's figures were too low, and that the volumetric heat of air at 100° C. may be taken as being within 1 per cent. of 5 calories per gramme-molecule, or 19·8 foot-pounds per cubic foot.

They have come to this conclusion with less difficulty because to a great extent they have Regnault's own authority for it. He appears to have been fully aware of the uncertainty introduced into his results by the heat-flow along the connecting-pipe. He discusses it in the same way as Callendar and Swann, and arrives at the same conclusion—that is, that it would be in such a direction as to make his results too low. The passage in his original paper in which he deals with this matter is of very considerable interest, both historically and in connection with the work of the

* See *ante*, p. 633.

* Dixon and Coward: "Ignition Temperature of Gases," "Journal of the Chemical Society," 1909; see also "JOURNAL," *ante*, p. 323.

† "The Specific Heats of Air and Carbon Dioxide at Atmospheric Pressure by the Continuous Electrical Method at 20° C. and 100° C." By W. F. G. Swann, A.R.C.S., B.Sc. Proceedings of the Royal Society, Series A, Vol. LXXXII., 1909.

Committee. [It was reproduced in full in an appendix to the report.]

For the volumetric heat of carbon dioxide, the Committee also feel justified in adopting Swann's values as correct to within 1 per cent. They are as follows:—

	At 20° C.		At 100° C.
Specific heat at constant pressure. . .	0·202	..	0·221
Volumetric heat—			
Calories per gramme-molecule (taken as 44 grammes)	6·930	..	7·760
Foot-pounds per cubic foot	27·400	..	30·700

II.—*Clerk's Experiments.*

In the first report it was pointed out that the values of the volumetric heat of gas-engine mixture obtained by Dugald Clerk by the compression and expansion of gas heated by combustion were (at a temperature of 1000° C.) about 10 per cent. higher than the corresponding values given by Holborn and Henning's experiments at constant pressure. Callendar expressed an opinion that the constant-pressure methods of determining specific heat were subject to systematic errors which would tend to make the results too low. This view has received further confirmation in the publication of Swann's work, to which reference was made in the last section; for Regnault's experiments were of the same character as those of Holborn and Henning, and any error of defect in his values might be expected to be of even greater magnitude in their experiments. On the other hand, Hopkinson gave reasons for supposing that Dugald Clerk's values were too high because of a difficulty in determining the division of heat loss between the compression and expansion lines. In support of this view, Hopkinson stated that he had found that when cold air was compressed and expanded in a gas-engine driven by an electric motor the values of the volumetric heat deduced by Clerk's method from the compression and expansion lines were too high, and that the air took in heat during the first half of the expansion stroke, though its mean temperature was above that of the walls.

This point has been made the subject of detailed experiments by Dugald Clerk, who communicated a preliminary account to the Committee in Note No. 11. His experiments were made on the "R" engine of the Institution of Civil Engineers' tests, † of 9 inches diameter and 17-inch stroke, which was driven by an electric motor. The exhaust valve of the engine was permanently closed during the experiments, and communication was made with a large reservoir containing dry air by means of the charge inlet-valve, which was held partially open until the desired engine speed was attained, when the valve was tripped and acted on by the usual cam, so as to take an air charge into the cylinder. The trip-gear was so arranged that after one full opening and closing the valve was held closed during the experiments, so that the air thus trapped in the cylinder was alternately compressed and expanded. In this respect, Clerk's arrangements differed from Hopkinson's, who kept both inlet and exhaust valves working continuously in the ordinary way; thus taking in a fresh charge of air at every alternate revolution—compressing and expanding it once and then discharging it. An optical indicator was used to take the diagrams, one of which is reproduced in fig. 1. [This diagram belongs to a later set of experiments.]

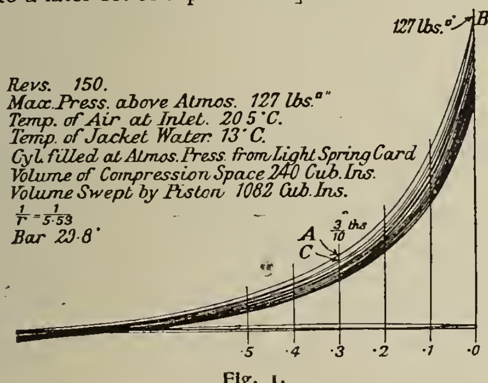


Fig. 1.

An analysis of the last three-tenths of the first compression line and the first three-tenths of the first expansion line (A B and B C on the figure) by Clerk's method, in which the heat loss is treated as the same in compression and expansion, subject to an allowance for the higher temperature in the former, gave as the value of the volumetric heat of air 20·9 foot-pounds per cubic foot, or 5·28 calories per gramme-molecule. This was the mean of six cards, three of which were taken at a speed of 120, and three at 180 revolutions per minute. The maximum value found was 21·1, and the minimum 20·5. The mean temperature on the expansion line was about 170° C., and the value of $\bar{C}$ obtained by extrapolating slightly from Swann's results would be 20·16 at this temperature and at atmospheric pressure. Unless, therefore, the difference in density gives rise to a greater difference in the volumetric heat than seems at all probable, Clerk's value is about 3 per cent. too high.

Clerk then went on to calculate from the diagram the actual heat loss on the compression and on the expansion stroke, assuming the true value of the volumetric heat to be 20. Comparing the heat loss in the last three-tenths of the compression (A B) and the first three-tenths of the expansion (B C), he found that they were in the ratio of about 3 : 1; whereas the mean temperature on compression was only about 11 per cent. greater than over the corresponding range in expansion. He further found that the heat loss from 0·1 to 0·4 on the expansion stroke was practically *nil*; while on the corresponding part of the compression stroke it amounted to about 7 per cent. of the work done on the gas.

Commenting on these results, Clerk says:

> The experiments show that the gas does not, on the whole, gain heat during the first half of the expansion stroke, as was found by Hopkinson.* But they do show that for some reason the heat loss is divided very unequally between the compression and expansion strokes. The proportion varies from point to point of the stroke, and also varies largely with the temperature of the walls; but for the inner one-tenth and the first three-tenths of the stroke the compression heat loss appears to be about three times the expansion heat loss. From this it follows that Hopkinson was correct in his expectation that the specific heat of air determined by division of heat loss in proportion to mean temperature would be too high. The experiments show that this method of division leads to a value about 3 per cent. higher than the true value.

Clerk also finds from these experiments that the greater part of the heat loss was incurred at the inner tenth of the stroke during compression and expansion at the higher temperature and density; 80 per cent. of the loss on the three-tenths was due to the inner tenth. The loss on the compression line from 0·4 to 0·1 of the stroke was small, and that on the expansion line was less. Calculating $\bar{C}$ as the mean value on these lines, the value is 20·7 foot-pounds per cubic foot. The mean temperature in this part of the diagram was 120° C.

In view of these experiments on the compression and expansion of cold air, the Committee consider that the division of heat loss in the high-temperature compressions on which Clerk's values of the volumetric heats are based may require some revision, and that these values may on this account be rather too high. The results given by air (as to ratio of heat loss between compression and expansion lines) at temperatures of the order 200° C. may, however, not be quantitatively applicable to gases cooling at the high temperature of 1000° C. It will be necessary to experiment further on high-temperature compression before the amount of the correction necessary on this account can be decided. Clerk has made arrangements to continue the work on these lines, and hopes to be able to carry his explosion experiments to about 3000° C. by a modified method.

Clerk determined the leakage of the piston by two methods, and found that it did not exceed 0·3 per cent. per stroke; so that error by leakage is negligible.

Hopkinson's suggestion that heat may be absorbed by a body of air when the mean temperature is higher than that of the walls enclosing it has been supposed by some to be impossible. If, however, the case be put in the following way, it will be readily admitted that his explanation is quite possible.

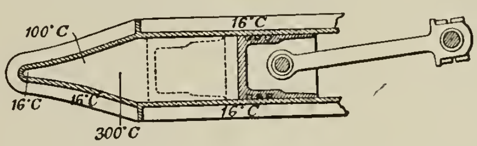


Fig. 2.

Referring to fig. 2, which is a diagrammatic section of a gas-engine cylinder having a very elongated compression space, if it be assumed that air be compressed within the cylinder until the piston is full in, as shown in the dotted position, then the mean temperature may rise to (say) 240° C. as a mean throughout the whole space; but the air at the extreme end of the space may be cooled down nearly to the wall temperature, assumed to be 16° C. The temperature will thus range from nearly 16° C. at the small end of the cone to perhaps 300° C. in the open part of the compression chamber. Such a disposition may be made to produce a mean temperature throughout the whole compression chamber of 240° C. If the air be now expanded by moving the piston from the dotted position to the full-line position, it is obvious that the temperature of the air, which has been reduced to 16° C., by contact with the walls, will fall below that temperature, and so heat may be added to the air at the extreme end, while heat is still being lost to the cylinder by the air near the piston. Many gas-engine constructions have narrow spaces, and the engine "R" above its inlet-valve has such a space, so that the temperature throughout, even during compression and expansion, may be very unequal.

Though unequal division of heat flow between the compression and expansion lines must be accepted as a fact, the Committee are not yet satisfied as to the explanation. The view put forward by Clerk in his original paper,† when discussing the possibility of an error from this source, was that the difference, if any, between the heat flow during expansion and during compression was

† *Vide* Minutes of Proceedings, Vol. CLXIII., p. 288.

* The gain of heat found by Hopkinson may have been due to the fact that he did not trap a single charge, but continually compressed and expanded fresh charges, in consequence of which the temperature of the cylinder walls, and especially of the face of the piston, must have been materially higher than in Clerk's experiments.

† Proc. Roy. Soc., Series A, Vol. LXXVII., 1906.

to be ascribed to a rise in the temperature of the surface of the metal or of a film adhering thereto. He expressed the opinion that any difference so caused could not be great on account of the small possible variation in temperature of the metal surface. Hopkinson's suggestion, on the other hand, was based on the possibility of large variations of temperature in the gas, and he referred the change of heat flow not to the metal surface, whose temperature (he thought) might for this purpose be supposed to be constant, but to changes in the temperature gradient in the layer of gas close to the walls. The controlling influence of the condition of the surface layer on the rate of heat flow from the gas appears in many experiments. In a gaseous explosion in a closed vessel, for example, the flow of heat from the gas to the walls is at first intensely rapid, for the hot flame is brought into immediate contact with the cold wall, and the heat is drawn from the still hot surface layer, and has not very far to travel. As time goes on, however, this layer becomes cooled down, and serves as a jacket resisting the flow of heat from the hotter core within. Study of the curve of cooling after explosion in a closed vessel shows the rate of fall of temperature diminishes in much greater proportion than the temperature itself; and the same thing was shown by Hopkinson's experiments with a recording calorimeter, in which the rate of heat flow was directly measured and found to vary nearly inversely as the square root of the time elapsed.*

The basis of Clerk's method is a comparison of volume and pressure changes in the rapid compression of a gas in a closed cylinder. In adiabatic compression the relation between these two quantities is

$$PV\gamma = \text{a constant},$$

and the mean value of the volumetric heat over the range of compression is $\frac{R}{\gamma - 1}$, where R is the gas constant and equal to 7·75 foot-pounds per cubic foot, or 1·96 calories per gramme molecule. The value of γ for true adiabatic compression is deduced from the actual indicator diagram by making corrections for heat loss in the manner to which reference has already been made. Another method of obtaining γ is to find the relation between corresponding pressure and temperature changes in rapid compression. For adiabatic compression this relation is of the form

$$\theta \propto P^{\frac{\gamma - 1}{\gamma}}$$

where θ is the absolute temperature. It has been applied for small ranges of temperature by Lummer and Pringsheim, and also by Makower, who suddenly opened to the atmosphere a large glass globe, containing air at a pressure of a few centimetres of mercury above the atmosphere, and measured the resulting fall of temperature at the centre of the globe by means of a platinum thermometer. He obtained in this way the value 19·3 foot-pounds per cubic foot, or 4·9 calories per gramme molecule, for the volumetric heat of air at 20° C., which is certainly within 2 per cent. of the truth, without making any correction for heat loss from the air at the centre of the globe where the temperature was being measured.

Hopkinson has commenced experiments, described in Note No. 13, with the object of applying a similar method to the compression of air in a gas-engine cylinder. The engine is motored round, taking in a charge of air at every alternate revolution, compressing it, expanding it, and exhausting it in the usual way. A fine platinum wire at the centre of the combustion space of the engine measures the temperature of the air at that point, and simultaneous measurements of the pressure at the beginning and end of compression are also made. A small correction for time-lag in the wire has to be applied. This amounts, at a speed of 250 revolutions per minute, to about 6° C. at the completion of suction, and is negligible at the top of compression. The value of the volumetric heat, calculated from the pressures and temperatures at these two points—on the assumption that the compression was adiabatic, and that γ was constant—is 20·33 foot-pounds per cubic foot; the values in different experiments ranging from 19·76 to 20·95. The true value, according to Swann, for the range of temperature employed (20° to 270° should be 20·1. It would appear, therefore, that the compression at the centre of the combustion space in an engine of this size (the diameter was 7 inches and the stroke 15 inches) is very nearly adiabatic; and there is reason to suppose that the method may yield good results when applied to higher temperatures. The experiments were all made at various speeds, ranging from 60 to 250 revolutions per minute; and the fact that the values obtained at 60 revolutions per minute are not systematically greater than those at higher speeds is further evidence that the loss of heat is small. The method has the advantage that it is independent of leakage.

Hopkinson found that in this engine at the top of compression the temperature of the air at a distance of 0·5 centimetre from the wall was about 30° less than in the centre. At points nearer to the wall—that is, within 1 millimetre—the temperature fell off very rapidly. It was still, however, decidedly above that of the wall at a distance of only 0·1 millimetre. He is continuing his experiments, with a view to giving a complete account of the temperature distribution, and elucidating more completely the phenomena of heat flow. The general result, so far as he has gone, would appear to be that the layer of air in which the temperature gradients are considerable is extremely thin. It may, in fact, be difficult to decide precisely what is the nature of the film which determines the heat flow. Once in solid metal, it is quite certain that the temperature variations are extremely slight, and cannot be such as to materially affect heat flow. On the other hand, the temperature of the air a fraction of a millimetre away from the wall is very much higher than that of the metal, and approximates to the mean temperature of the gas. It is the temperature gradients in the composite layer of matter, partly air and partly solid or oil film, between these points which finally determine the heat flow. It is possible that Clerk, who regards the solid and adherent film as the seat of the temperature changes* and Hopkinson, who ascribes the action to a thin layer of air, are really dealing with the same thing from opposite points to view.

(To be continued.)

* *Ibid.*, Vol. LXXIX., p. 138.

* In later experiments on the compression and expansion of air in "R" engine, with a very large flow of water through the jacket, Clerk finds that the heat flow of compression and expansion becomes nearly proportional to relative temperatures. This appears, in Clerk's view, to support the hypothesis of an adherent film, which in some conditions of experiment accumulates heat and rises in temperature.

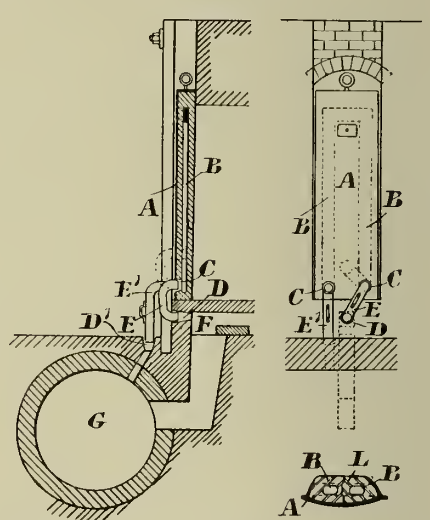
REGISTER OF PATENTS.

Doors for Retorts, Coke-Ovens, and Other Furnaces.

Shaw, F., Percy, T. McL., and Entwistle, J. K., of Ince, Lancs.

No. 17,647; Aug. 22, 1908.

This invention relates to the heating of the doors of retorts, coke-ovens, and other furnaces to prevent "black ends" or the imperfect coking of portions of the charge, and consists in connecting the interior channels with the flues by removable bridge-pipes, whereby a portion of the waste gases or products of combustion from the heating flues are passed through the door to the chimney.



Shaw, Percy, and Entwistle's Coke-Oven Door.

The illustration shows the application of the invention to a coke-oven. Channels B are built in the lining of the door A and provided at their lower ends with openings or sockets C, which can be connected to similar openings or sockets D D1 in the sole, main, chimney, or other flue of the retort or oven, by means of a movable bridge or junction pipe or pipes E E1 when the door is closed. The channel in the door is connected to the sole flue F of the oven by the bridge-pipe E, and to the main chimney flue G by the bridge-pipe E1; thus forming a sort of bye-pass for the hot gases on their way to the chimney. In addition, openings may be made near the top of the door into the channel B, through which a portion of the hot gases in the top of the oven can flow down to the bridge-pipe E1 at the bottom of the door, and thence to the chimney.

The invention is shown as applied to a liftable door lined with fire-brick blocks L, with passages adapted to form vertical channels B connected at the upper part of the door. Openings or sockets connecting with the channels B are made in the outside of the door, and the bridge-pipes E E1 connect the channels B with any of the ordinary flues of the oven or retort.

Pipe-Coupling.

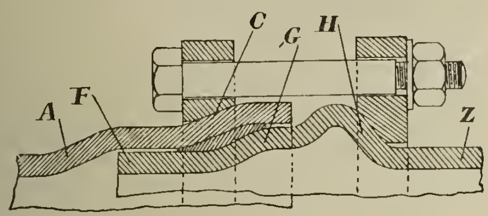
Clark, W.; a communication from the Dellwik-Fleischer Wasser-Gas Gesellschaft, m.b.H., of Frankfort-on-the-Main.

No. 22,423; Oct. 22, 1908.

This coupling for pipes belongs to the class of sleeve couplings in which an enlargement serving as an abutment for a slipper-on ring is formed at the end of each pipe, so that the pipe ends are forced together by tightening-up the connecting screws with which the two rings are provided. It consists in the special shape of these enlargements, "which shape is of importance, both for ensuring a perfectly tight joint and for readily establishing the connection; the elasticity consequent on this shape rendering expansion pieces unnecessary."

A portion of the pipe A near the end is enlarged to form a cylindrical sleeve, from which extends a divergent conical portion C. The end F

of the other pipe Z maintains its original cylindrical form, and is provided with a conical enlargement G, which corresponds to the enlargement C of the other pipe-end. In rear of the enlargement G there is a



Dellwik-Fleischer Pipe-Coupling.

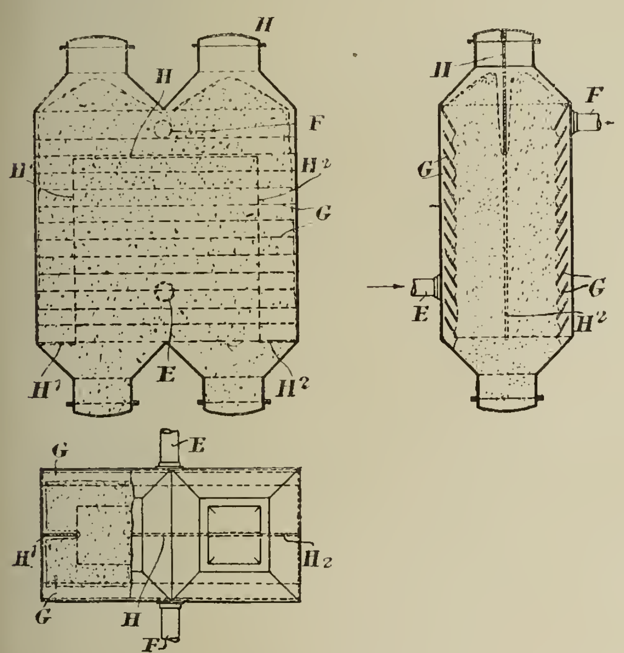
further enlargement H, constituting a spring bead extending around the outer surface of the pipe. Packing material being provided, flanges or rings are placed on to the pipes, and they are drawn together by screw bolts.

Gas Purifying Apparatus.

Schmiedt, E., of Aschaffenburg, Germany.

No. 5768; March 10, 1909.

This invention relates to purifying apparatus of the type comprising one or more "towers" (having closed tapering ends) within which louvres are provided where the gas enters and leaves each tower—thus "ensuring the most uniform distribution of the gas possible throughout the purifying mass." The inner walls of the tower are provided, between the louvres at the inlet and outlet of the gas, with approximately vertical baffles, which project into the purifying material in such a manner that they prevent the direct passage of gas from the inlet to the outlet, even if there be free spaces between the walls of the tower and the purifying material.



Schmiedt's Gas-Purifier.

The apparatus illustrated comprises two towers connected together, and each provided at its upper end with a cover for filling or charging, and with a lower cover for emptying or discharging. In the lower part of one side wall is the gas inlet pipe E; while the gas outlet pipe F is connected to the opposite side wall. The two side walls are provided with louvres G, "by means of which the gas is distributed throughout the whole cross sectional area of the tower as it enters and before escaping." Between the two sets of louvres is arranged a vertical partition or baffle plate H, the upper portion of which extends across the two towers and fits closely against the inner walls of their upper part; while the two portions H^1 H^2 extend downwards from the main baffle, and are connected to the transverse walls at right angles thereto. The baffle projects from the top of the tower to below the lowest louvre, and from the transverse walls a short distance into the purifying material, as shown. If the upper covers are arched, they are provided with ribs which, when the covers are closed, fit tightly against the upper edge of the baffle.

If, after the charging of the purifier, fritting or settling of the purifying material takes place during working, no portion of the unpurified gas entering through the pipe E can pass direct to the outlet pipe F through any free spaces formed, but all the impure gas is forced to flow round the baffle H H^1 H^2. The gas has consequently to pass through the purifying material between the baffle and the outlet.

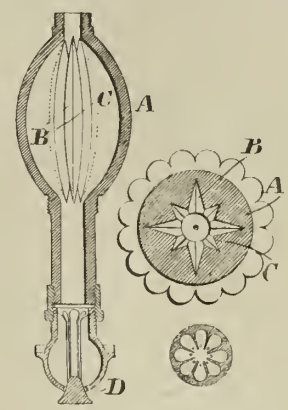
Inverted Incandescent Gas-Burners.

Fisk, J. W., of Cardiff.

No. 6588; March 19, 1909.

This invention consists in the formation of a recuperating chamber in the bunsen tube and in a substantially corresponding formation of the nipple, either singly or in combination in an inverted incandescent gas-burner.

The bunsen tube between the air regulator at top and the attachment for the globe gallery, is expanded so as to form a recuperating chamber



Fisk's Inverted Gas-Burner.

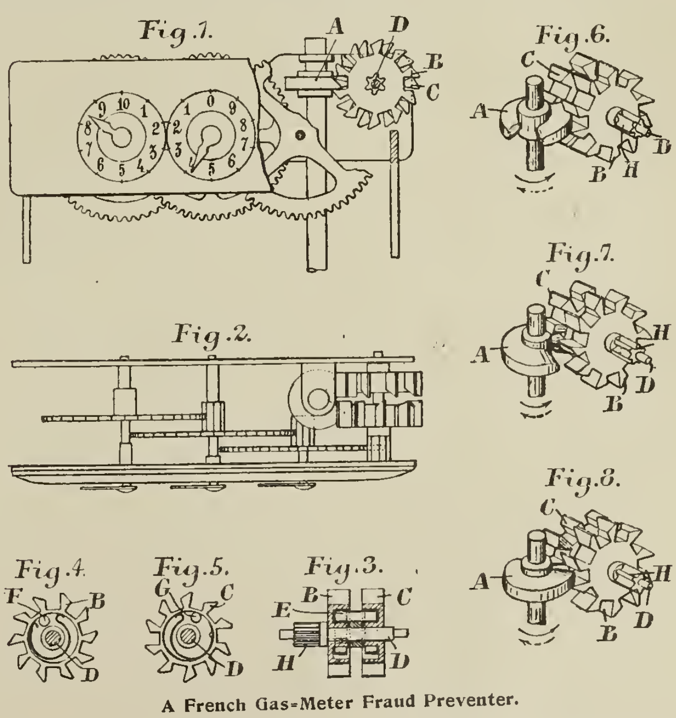
A for the more intimate blending of the gas and air. The chamber tapers in diameter towards each end. The bore of the tube also preferably expands from the ends of the chamber, and is provided with radial longitudinal triangular extensions B, alternating with like, but shallower, extensions C, both series of which taper in sectional area towards the bore at either end of the chamber. At its maximum diameter the bore of the chamber thus substantially presents the form of a star. The nipple attached to the lower part of the bunsen tube is furnished with radial sockets to receive the mantle lugs. It is expanded into globular form; the inner chamber of the nipple presenting a formation like the recuperating chamber. It is subdivided by a series of ribs into a number of radial chambers opening into a common central bore and converging at the bottom towards a convex inward projection of the spreader D. Each chamber is provided at the bottom with a minute hole, so that the mixture of gas and air from the recuperating chamber escapes in a series of radial jets according to the number of radial ribs, or radial chambers.

Recording Mechanism for Meters.

Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, of Paris.

No. 10,062; April 28, 1909. Date claimed under International Convention, April 29, 1908.

This invention relates to an arrangement whereby the hands of the registering mechanism of a meter are caused to rotate always in the same direction, even if the direction of rotation of the measuring parts —such as the drum or bellows of a gas-meter or piston of a water-meter or equivalent device—were reversed, either owing to an error in the manufacture or intentionally for the purpose of making the registering mechanism reduce the amount recorded.



A French Gas-Meter Fraud Preventer.

When applied to gas-meters with a drum, the device presents as its main advantage that the locking pawl with which such meters are generally provided for the purpose of preventing reverse movement is done away with. This pawl, as the patentees point out, is the cause of serious disadvantages, for sometimes it renders the levelling operation very difficult. Moreover, the consumer can, by exchanging the inlet and the outlet pipes or by blowing from the outlet side, not only make the apparatus count backwards by forcing into the inlet conduit a certain volume of gas or air, but can also expel outwards a portion of the water from the meter until the gas passes directly through the centre of the fly-wheel without being measured. During the time that the water is being forced back, the pawl preventing the drum from rotating in the opposite direction allows the air blown into the meter to

exercise pressure on the surface of the water, the level of which is lowered at the outlet side and raised at the inlet side, so that the water escapes through the overflow pipe arranged on the inlet. If the valve does not close hermetically, the meter admits the gas from the inlet to the outlet directly without measuring, when the level of the water is lowered sufficiently. If, on the contrary, the valve closes tightly, it is sufficient, in order to obtain the same direct passage of non-measured gas, to incline the apparatus so that the water flows forward and raises the valve, though at the same time the back portion is left unprotected and the central opening of the drum is uncovered, and the gas can pass through this opening directly from the inlet to the outlet without any movement of rotation of the drum, and consequently without measuring.

The locking pawl of the measuring device having been done away with according to this invention, any fraudulent attempt made in the conditions indicated will be useless, "for in that case the air or gas blown in will act on the drum to cause it to rotate in the direction opposite to that of its ordinary movement, without producing any change in the level which would enable the water to escape outside." It is pointed out, moreover, that with their device the volume of the air blown in, instead of being subtracted from the volume normally registered, will, on the contrary, be added to it; "so that any fraudulent attempt will be to the disadvantage of the defrauder."

Fig. 1 is a longitudinal elevation of the arrangement, with certain outer parts removed. Fig. 2 is a plan of one construction of mechanism. Fig. 3 is a cross section through the axis of one of the essential parts of the mechanism shown in figs. 1 and 2. Figs. 4 and 5 are cross sections through fig. 3, but in opposite directions. Figs. 6, 7, and 8 are perspective views of the same part as fig. 3 combined with its controlling member—both being shown in different positions.

The vertical spindle on which the measuring part of the meter acts is provided with a slotted disc A, with bevelled radial edges directed towards the lower face of the disc with which, and at each side of the vertical plane of its axis, two toothed wheels B C engage, mounted on the same spindle D. The teeth of these wheels are bevelled on the one hand in the same direction in accordance with one of their radial faces, and, on the other hand, in the opposite direction in accordance with their corresponding adjoining faces perpendicular to the spindle D. The wheel B is secured to the spindle D, while the wheel C is mounted in such a manner that it can rotate on this spindle and be brought into a given position where the teeth of the two wheels do not coincide, under the combined action of two springs arranged respectively in a recess of each of the wheels, and of a common stop E oscillating freely on the spindle D and having the tendency to be maintained by the springs in contact with the pins F G of the wheels. The combination of the slotted disc A and of the spring-controlled wheels B C constitutes a kind of double anchor escapement, working in such conditions that, whatever be the direction of rotation of the disc A, the movement transmitted to the spindle D is always in the same direction—in fact, the wheels B C, owing to the action of their inner springs, have the tendency to remain in such position relatively to each other that their teeth are in staggered order. Thus, during the movement of rotation of the disc A (whatever be the direction of this movement), one of the bevelled edges of the disc always engages with the tooth with which it meets from below, so as to raise it, and consequently rotates the wheel in a given direction to any desired extent, in order to bring it into a position in which its teeth coincide with those of the other wheel—that is to say, into a position which allows the solid portion of the disc A to pass between the corresponding teeth of each of the wheels B C.

Figs. 6, 7, and 8 show clearly the main stages of working of this kind of double escapement. In fig. 6, the disc A maintains, by means of its solid portion, the two wheels B C (shifted relatively to each other) in such a position that their teeth coincide; so that, assuming the direction of the rotation of the spindle to be as shown by the arrow in full lines, the wheel B will advance to the extent corresponding to the distance to which it has moved as soon as the recess will allow this advance, as shown in fig. 7. The disc A continuing to rotate in the same direction, as soon as the edge of the recess passes under the teeth of the wheel B which has just advanced, this tooth is raised to an extent corresponding to the tension of the spring of the wheel C, so that the latter escapes in its turn, in order to advance to the extent of half-a-tooth when the recess passes in front of the tooth of the wheel C which the disc was holding. It therefore follows that to each rotation of the disc A correspond successive advances to the extent of one tooth for each of the wheels B C; and this movement is transmitted by the pinion H of the spindle D to the wheels of the registering mechanism.

The same stages of working are successively reproduced when the disc rotates in the opposite direction—that is to say, in the direction of the dotted arrow, with the difference that it is the wheel C which escapes and which is shifted relatively to the wheel B in order to allow the escapement and the subsequent shifting of the latter.

APPLICATIONS FOR LETTERS PATENT.

20,447.—Fabry, R. F. F., "Recovering the bye-products of coal gas and the like." Sept. 7.

20,486.—Lucas, H., "Gas-burners." Sept. 7.

20,492.—Duchanoy, M., Bousquet, G., and Davicion, M., "Gas-producers." Sept. 7.

20,504.—Simonin, H., "Utilization of the waste of the purification of illuminating gas." Sept. 7.

20,592.—Tully, C. B., "Retort-furnaces." Sept. 8.

20,600.—Lea, J. W., and Perrins, J. H., "Incandescent gas." Sept. 9.

20,625.—Lines, A. A., "Attaching globes." Sept. 9.

20,631.—Riedel, R., "Extracting nitrogen and carbonic acid from combustion gases." Sept. 9.

20,653.—West, J., "Discharging and charging machine for gas-retorts." Sept. 9.

20,658 —Surmont, F., "Acetylene generator." Sept. 9.

20,716.—Shears, F. W., and Lee, G. W., "Incandescent burner." Sept. 10.

20,774.—Woodward, F. G. A., "Eyeleted and wind-proof mantle." Sept. 11.

20,828.—Yates, H. J., "Gas-heated radiators." Sept. 11.

MISCELLANEOUS NEWS.

THE CALCUTTA LIGHTING CONTRACT.

Some Correspondence.

As a further step in the negotiations which have been taking place between the Calcutta Corporation and the Oriental Gas Company with reference to the public lighting of the city, we have had sent to us for publication the following letters, which appeared in the "Statesman" for Aug. 26. These relate to a draft agreement which was generally approved at a meeting of the Special Committee appointed to consider and report on all matters between the Corporation and the Gas, Tramways, Telephone, and Electric Light Companies.

On July 30, the following letter was written on behalf of the Oriental Gas Company to the Chairman of the Corporation.

No. 1.—I now have the honour to enclose signed draft contract drawn up in consultation and in agreement with Mr. Mansfield in accordance with the cable received from the Corporation of Calcutta on the 16th of June last. The Directors recognize that the present condition of mains and services in Calcutta is not such as to ensure compliance with the terms of the new contract; and with a view to being in a position to carry out the conditions as to pressure, they have already spent considerable sums in the provision of new mains, and have sanctioned the further heavy expenditure necessary to execute the proposed arrangements in a satisfactory manner. They also undertake that, as soon as possible after ratification of the new contract, this work shall be completed under the direct supervision of a capable, experienced, and responsible distribution engineer, who will be in charge of a special Mains Department, and whose services shall be retained (or replaced as may from time to time be necessary) during the whole period of the contract. It will be the duty of this Mains Department at all times during that period to maintain all main and service-pipes and the brass cocks on the public lamps in the highest possible state of efficiency and repair. With regard to the Company's works, it is probably within the knowledge of the Corporation that very considerable extensions and improvements have been effected by the Company during the past few years; and I am directed to convey to you the Board's assurance of their intention at all times to take such steps as may be requisite to ensure that the Company shall be in a position fully to meet any demands that may arise for the supply of gas for both public and private lighting.

No. 2.—During the discussion of the draft agreement for the public lighting of Calcutta with Mr. Mansfield, the Directors wished, as usual, to insert a clause exempting them from the payment of municipal rates, as they feel they have a strong claim to such exemption, which has been allowed for the past 50 years. Mr. Mansfield, however, informed them that he was aware a resolution had been passed on this subject, and he had no instructions to discuss the matter. He knew there was a strong feeling in Calcutta in favour of a suitable pressure being maintained during the daytime. He thought, if the Directors would agree to guarantee a minimum pressure during the daytime, you would be prepared to reconsider the matter and to continue the exemption of the Gas Company from payment of rates. The Directors therefore suggest the insertion of a clause in the new contract as follows: "The said Corporation shall pay or bear all municipal rates and taxes which have been, or hereafter during the continuance of this agreement shall be, made, assessed, or levied by the said Corporation upon the said Company for any premises occupied by them in Calcutta, whether in use, occupation, or otherwise; and in consideration of this concession, the said Company agree to maintain a minimum pressure of gas during the daytime which shall never be less than one inch."

Then follows a letter addressed by Mr. Alfred Mansfield to the Chairman of the Corporation, dated July 30.

I beg to report that I have completed the negotiations, on your behalf, with the Directors of the Oriental Gas Company, Limited, in London, for the public lighting of Calcutta. I am sending by this mail a printed draft of the proposed agreement, signed by the Oriental Gas Company and myself, for your consideration and approval. I beg to draw your special attention to the following points.

The Corporation undertake the supply of all lamp-posts, brackets, lanterns, burners, and mantles, and the lighting and extinguishing of all public lights. This leaves the Corporation free to make any arrangements they choose with regard to these important items.

The Gas Company will be paid for gas only at a fixed rate per 1000 cubic feet; and we have definitely arranged the method of measuring the gas, which I think you will find is satisfactory.

The Gas Company will supply coal gas only; and if they wish to dilute or enrich this gas, they must first obtain the consent of the Corporation in writing. This is a very important clause.

The Gas Company supply all pipes, including the cock at the top of each lamp-post. In the past, I understand, the Corporation have supplied the piping from the bottom of the lamp-post, including the brass cock. A number of the existing brass cocks are defective, and of bad design. It will be necessary to replace these. The Gas Company will supply and fix all piping and brass cocks, at their own expense, to all new lamps. An awkward position would then be created, unless the Gas Company become the owners of the small quantity of piping and the brass cocks which exist, as the owner is naturally responsible for maintenance. I have therefore arranged, subject to your approval, that all this piping inside lamp-posts and the brass cocks, paid for by the Corporation, become the property of the Gas Company in exchange for their undertaking to maintain them in a satisfactory condition, and supply any new brass cocks which are required, of a pattern approved by the Corporation, at the expense of the Gas Company. I trust this will meet with your approval.

With regard to the price of gas, my endeavours to select a number of towns in England whose example could be followed with advantage to the Corporation were not successful. I plainly saw that the insertion of such a clause would lead to endless arbitration or litigation.

English towns are by no means perfect in their gas supplies. I therefore suggested, and the Directors agreed, that it would be better to fix a definite price up to a minimum pressure of 4 inches. For a time we were in serious disagreement. The Directors insisted that their price of Rs. 2-8 per 1000 cubic feet was for 2 inches pressure only. The views on both sides were so strong on this point that I was afraid we would not be able to agree. I am glad, however, to say that we came to terms, as shown in the draft of the agreement. I have no hesitation in advising you to accept these terms, as the price is reasonable, and you will be able to take advantage of increased pressure, or not, at your pleasure, after the first five years of the agreement, without arbitration or reference of any kind.

The testing clauses are explicit; and in order to make them absolutely complete, I have introduced into the agreement all instructions and particulars which are necessary, so that no question can at any time arise as to the method of conducting tests. The instruments to be used, the standard of light, and all other points are in conformity with the best practice in England, adapted to the climate of Calcutta. The penalties are such as to ensure the rigid observance of all the clauses in the agreement.

The Directors wished to insert a clause exempting them from Municipal rates; but I pointed out that this was entirely outside my province. I am aware that a resolution had been passed declining to admit any exemption from rates in the new contract, although this has been enjoyed for the past fifty years. My only regret is that I have not been able to insist on a day pressure. I am officially advised by you that the Gas Company have special powers from Government, and the Corporation have no control over day pressure. I beg to suggest that gas during the daytime is a necessity; and the ratepayers in such an important town as Calcutta have some claim on the Corporation to see that they are supplied with gas at a proper pressure. I informed the Directors that, while I had no authority to discuss this matter with them, I would be prepared to suggest that the question of exemption from Municipal rates be reconsidered on condition that they agreed to maintain a day pressure, which would enable private consumers to use modern appliances for heating and cooking, or gas-engines for industrial purposes, during the daytime. They are willing to consider this, and have addressed a letter to you on this subject. I trust this matter will receive your favourable consideration, as I feel the arrangements will not be complete without some provision being made for the private consumer.

I expressed a desire that the Directors should forward to you a letter indicating their recognition of the fact that considerable improvements were necessary, and the manner in which they propose to carry them out. They have sent me a draft of a letter which they are sending to you, which is in accordance with my wishes.

I trust the terms we have arranged will be confirmed. Every detail has been so fully argued from both sides, and the Directors of the Oriental Gas Company have met me on so many points, that I am convinced it will be useless to suggest any amendments unless the whole question is again re-opened.

To the correspondence, is appended the following note by the Chief Engineer:

I have read through the agreement very carefully. In my opinion it is a masterpiece, and is probably the most perfect agreement existing for the supply of gas to any large city. I therefore trust that the Committee and the Corporation will allow the agreement to remain as it stands, as I am strongly of opinion that any changes would probably turn out for the worse. With reference to the proposal that the gas-works should be exempted from rates as in the past, I have only to remark that this is entirely a matter for the Commissioners to decide; but I would suggest that if the proposal is considered at all, exemption should not be granted for any less day pressure than 15-10ths. This latter pressure is sufficient for working gas-engines, water-heaters, cookers, &c. In conclusion, I have only to state that I am of opinion that Mr. Alfred Mansfield has been much more successful in these negotiations than I expected.

BRISBANE (QUEENSLAND) GAS COMPANY.

A Presentation to the Chairman after Thirty Years' Service.

The Half-Yearly General Meeting of the Brisbane Gas Company was held on Friday, Aug. 6—the Hon. JAMES COWLISHAW, M.L.C., presiding—when the report and accounts were presented. Some particulars as to the results of the working were given last week, p. 707. The report was adopted, on the motion of the Chairman, seconded by Mr. T. Budd. A vote of thanks was also extended to the officers of the Company.

When the business of the meeting had concluded, the Deputy-Chairman (Mr. James Clark) took the chair. He announced that he had received a number of apologies from shareholders who were unable to be present, but who joined with those at the meeting in extending their congratulations to their Chairman, and welcomed the idea of making him a presentation, which would show, in a slight measure, their appreciation of the work which he had done. Mr. Clark reviewed briefly the progress of the Company's business since Mr. Cowlishaw became Chairman in 1879; and he showed that the progress made not only had kept pace with the progress of the city, but that the interests of shareholders and citizens alike had been safeguarded. The opportunities for investment in the Company's business now were regarded as the best on the market.

Mr. D. J. Abercrombie supported the remarks of the Deputy-Chairman, and said he yielded to none in the high esteem which he had of the ability of Mr. Cowlishaw. It was with extreme pleasure that, on behalf of the shareholders, he wished to express his high esteem, his admiration, and his appreciation of their Chairman's work.

Mr. L. M. Bond also expressed the opinion that the shareholders owed a deep debt of gratitude to Mr. Cowlishaw for the work he had performed.

Mr. G. Phillips said that the details given by the Deputy-Chairman in his brief review of the Company's position, showed that the interests of the citizens of Brisbane had not been neglected. The frequent reductions in the price of gas showed that the Chairman had studied not only the interests of the Company, but also the interests of the citizens.

Mr. Clark then handed to Mr. Cowlishaw a service of plate, and in doing so, he said it afforded him the greatest pleasure to present to Mr. Cowlishaw such a handsome gift, and he hoped he would long be spared to direct the affairs of the Brisbane Gas Company.

[The service of plate consisted of a tea and coffee service, on a silver tray, an afternoon tea set to match, two epergnes, and a soup tureen.]

Mr. Cowlishaw, responding to the toast of his health, thanked the Deputy-Chairman and other speakers for their kind remarks concerning him, and the shareholders generally for the confidence which they had reposed in him. The Deputy-Chairman, he said, had given those present some idea of the progress which had been made by the Company, and standing there that day and surveying the difficulties which they had overcome, and the triumphs which they had won, he could not fail to be impressed, not only with the success of recent years, but by the careful manner in which the Company's interests had been safeguarded by Directors and Officers in the years of its infancy, so to speak. At a meeting held on Feb. 23, 1864, presided over by Mr. Shepherd Smith, the Manager of the New South Wales Bank, it was decided to establish a Gas Company. As soon as professional services were required, Mr. Robert Fleming, uncle of Alderman P. Fleming, of the City Council, was appointed Engineer. Of all the shareholders of that year, only three were shareholders and living now. He (Mr. Cowlishaw) for some years acted as Auditor to the Company; and in the year 1879 he was appointed Chairman, which position he still held, after an interval of thirty years. Some of the speakers, he said, too generously had mentioned that his individual efforts had been responsible for the progress which had been made. He was proud that his efforts, small though they were, had met with the commendation of the shareholders; but he wished to say that the success which had followed his years of office had been made possible only by the loyal and devoted services of the officers and staff.

The service of silver plate referred to is, it is said, regarded by competent judges as the best collection which has ever been imported into Queensland. It bore the following inscription: "Presented to the Hon. James Cowlishaw, M.L.C., by the shareholders of the Brisbane Gas Company, as an expression of their esteem, as well as an appreciation of his zeal and untiring service during the past thirty years as Chairman of the Company, 6th August, 1909."

GAS SUPPLY IN DUNEDIN.

The Work of a Distribution Department.

In the course of his fourth annual report to the Dunedin City Council (dated April last), dealing with the more important matters that have from time to time engaged the attention of the Council during the past year, Mr. R. W. Richards, the Town Clerk and City Engineer, makes the following remarks upon the work of a distribution department, in connection with the Municipal gas undertaking. It will be noted that the question of distribution was specially referred to during the proceedings at the opening of the Dunedin Gas-Works extensions which are reported in another part of this issue.

Now that the gas-works extensions have been completed, and that the Council have the Caversham Gas-Works in their undertaking, it is perhaps fitting to again submit the advisability of the Council controlling and directing the distribution of the gas to the consumers' burners—bearing in mind that when a city corporation are the makers and the vendors of a commodity which is of almost universal necessity to the community the corporation represent, there is a duty, if not a moral obligation, cast upon the municipal body to ensure that such commodity is not only delivered to the customers of good quality and in sufficient quantity to meet their demands, but also that they shall have every facility and information for its use to the best effect for the lowest possible cost. Of late years, a great evolution to this effect has taken place in the attitude of gas authorities and companies towards their customers. In the case of corporation gas undertakings, no doubt this is due to some extent to the electrical propositions that compete; but they, as well as the gas companies, have also been influenced by the commercial axiom that to obtain and keep customers it is not enough to sell them goods—they must be shown how to use them, and that to the best advantage.

Hence there has arisen in all thoroughly up-to-date gas undertakings a department that takes charge of the gas after it leaves the mains and services, and has passed through the consumer's meter. This department, which may be called the distribution department, gives to the consumer of gas the benefit of its technical knowledge to ensure that he obtains the best possible results from the gas purchased.

When gas first came into use as an illuminant, and when gas lighting was so crude in its methods that no skill beyond that of fitting the necessary supply-pipes was necessary to instal it, the business of gas-fitting was, naturally enough, taken over by the already-existing trade of plumbing; and as far as that trade is concerned, practically no advance has been made in gas-fitting to this day. Some authorities writing on the subject make bold to assert that "notwithstanding the delicate apparatus that the modern gas-lighting burner really is, with its careful proportion and adjustment of gas and air to obtain perfect and economical results, not one plumber in twenty has any real knowledge of the construction of a bunsen flame, to say nothing of an appreciation of the requirements for lighting special buildings and areas with regard to their particular needs." It was therefore necessary that a new and specialized form of gas-fitting should arise; and as the only persons possessing any interest in gas-fittings and appliances after they are sold, apart from the consumer himself, are obviously the gas authorities, they are stepping, and have stepped, into the breach, with results equally satisfactory to customers and themselves.

The question next arises, What are the duties and scope of such a

department? Its first duty—the mains department having delivered gas to the premises—is to ensure that a meter of sufficient size is supplied, and that the pipes fitted to the premises are sufficiently large to supply the gas where needed. They should be prepared, where required, to supply and fix the necessary pipes; and in no case should any other person be permitted to fix pipes before the gas reaches the meter. Further, they should be prepared to supply fittings and burners of the latest and most carefully selected description, advising the consumer as to the best position and grouping of lights to suit his special needs. This is particularly important, as in some cases many lights of small candle power are the best, while in others single units of high intensity are more suitable.

But even when the gas is delivered, fittings of the latest, most artistic, and most scientific description supplied, and the whole installation is—what it easily can, and certainly should, be—a monument to the fact that gas is still the cheapest and best of all illuminants, the benevolent supervision of the distribution department should not cease. An arrangement should be made with the consumer by which, for a payment which little more than covers expenses, periodical visits shall be paid to the premises, new mantles fixed where needed, globes and chimneys cleaned, burners re-adjusted, and, in fact, the whole system kept in the condition it was left in when installed. A writer on the subject has stated: "It is positively painful to one who has been trained in this system to pass through the streets of some towns and see the evidences of neglect in the form of carbonized burners and dirty chimneys and globes, obscuring anything from 40 to 70 per cent. of the light that is being paid for."

Of course, in the working of such a department as is here outlined, the great factor is the man in whose charge it is placed. Too much emphasis cannot be placed on this fact, as it is worse than useless for a gas undertaking to attempt to attain the perfection laid down unless they obtain or possess a distributing superintendent who is able to carry out thoroughly the promises which the existence of such a department implies. It should be remembered that this man is the actual point of contact between the gas undertaking and its consumers; so that, taking for granted his technical knowledge and ability, he should also be a man of pleasing personality and of consummate tact, for with the exception of those little differences of opinion as to the amount of gas bills, which will occur in the best regulated gas offices, all consumers' complaints and disagreements will have to be adjusted by him.

The superintendent should have, as his lieutenant, a thoroughly skilled gas-fitter, one whom the superintendent may trust in the early stages of the department to carry out accurately and intelligently his instructions, and thus save him the necessity of constantly re-visiting premises to note progress, and who should be destined, as the department develops, to become the foreman of the gas-fitters, who will, as necessity arises, be engaged. These two, with a clerk (who might act also as storekeeper), should be sufficient to start the department on a proper basis; and further needs will suggest themselves naturally with increased business.

With regard to the charges made for work done by the Council, there are three possible theories:—

(1) Do not enter into cutting competition with the local tradespeople. Charge such a price as to compare with their present charges.
(2) Charge a fair profit, so that the only tradespeople injured will be those who charge exorbitantly.
(3) Charge your customer net cost, allowing only sufficient profit to pay such charges as office expenses, salaries, interest on capital, and so on. Such a profit would, of course, vary with the turn-over, and if no loss even at first was looked for, should probably be about 20 per cent., which might be reduced as the business increased.

There is no doubt in my mind that the last is the correct course to adopt. I am aware that an outcry arises usually from the local plumbers; but I entirely fail to see where they have a grievance. Probably under the second course of treatment they have the greatest right to complain, as here the gas authorities are actually making a profit by their competition. But the gas authorities' position in adopting the third course seems to me to be unassailable. Summed up, the position is this: That the customers of the gas authorities, in consideration of the profit they provide from the gas they consume, have a claim upon those authorities to the extent that any saving that may be effected or any improvement that may be obtained in the purchase of appliances for the consumption of that gas should be given them; and this claim should be paramount over the demand of a trade interest to be allowed to make another profit out of these consumers.

Mr. Charles Eyers, a lighting expert of the United Kingdom, with whom I have conferred on this subject, on the occasion of my last visit to Sydney, and to whom I am indebted for the views that are mainly expressed herein, says: "It is in fact the doctrine of the subordination of the advantage of a section to the public interest. I had an example of this trade objection to the progressive tactics of a gas undertaking in England, when a deputation of the local Ironmongers' Association waited upon the Gas Company with which I was associated, and petitioned them to refrain from competition by selling gas-fittings. Yet most of the members of the deputation were, while anxious to keep up the price of gas apparatus, actually aiding competition with the Gas Company by selling and fitting electric light apparatus. In this connection, it is well to notice that practically everywhere when local authorities have undertaken electric lighting, they have also undertaken, so far as I know, without any serious opposition, the whole installation from dynamo to lamp if required by customers; and in many cases I have heard this policy set forth as the main reason for using electric light instead of gas—the consumer arguing the convenience of immediate appeal in case of breakdown or defect to a skilled and competent authority, instead of to a tradesman of problematic knowledge, who, in the end, might have to fall back on the gas company to locate the fault, and thus cause considerable and vexatious delay."

In previous reports to the Gas Committee, I have dealt with this subject; but it is necessary to include these remarks in this, as the foregoing succinctly sets forth a system that might well be instituted, it being in consonance with the writings of Mr. Robert English, our Consulting Gas Engineer, as well as of Mr. John Hungerford, who is the Resident Engineer.

In conclusion, I am convinced that a well-worked distribution department, with an efficient head, is invariably the source of a much more cordial feeling between producers and consumers, a much more intelligent appreciation of the methods and regulations of a gas undertaking, a greatly enhanced confidence in gas as a lighting, heating, and cooking agent, and finally that *desideratum* a very greatly increased consumption of gas.

The following are a few facts and figures relating to the year's operations, as compared with the preceding year:—

	1907-8.		1908-9.
*Number of consumers	6,049	..	5,962
*Sales of gas	127,299,200 c. ft.	..	145,942,300 c. ft.
*Representing gross cash	£49,483	..	£51,297
*Gas made	141,042,788 c. ft.	..	159,577,187 c. ft.
Coal carbonized	11,121 tons	..	11,571 tons
Average make per ton	12,392 c. ft.	..	12,142 c. ft.
Gas unaccounted for	4·9 per cent.	..	2·8 per cent.
Services laid	271	..	306
Loan expenditure to March 31, 1909	..	..	£52,131

* About 250 special meters were removed owing to a reduction in the price of gas. The price was reduced from 5s. 10d. net per 1000 cubic feet to 5s. in November, 1908.

BRADFORD GAS ACCOUNTS.

A Deficit.

At the Monthly Meeting of the Bradford City Council last Tuesday—the LORD MAYOR (Mr. James Hill) presiding—the results of the past year's working of the various undertakings of the Corporation were placed before the members.

Mr. DAVID WADE, the Chairman of the Finance and General Purposes Committee, in making his annual statement, said that, speaking generally, the year's work, so far as the volume of business was concerned, had not been marked by any violent fluctuation; and apart from the storm which occurred in the Wharfedale district last year, costing in repairs some £5000, and a diminished income from gas and residuals of £8000, the net result was practically up to the previous year's level. The aggregate income of the trading concerns was £903,465, and the working expenditure £564,139; leaving a trade profit of £339,326. The charges for interest and sinking fund amounted to £317,907, leaving a net income of £21,419, as compared with a net income the previous year of £36,428. As regarded the water-works, the income was £178,904, and the working and management expenses, including the cost of repairs necessitated by the flood at Barden, amounted to £42,748; leaving a trade profit of £136,156. Against this there was charged for interest and sinking fund £127,580, which left a net profit of £8576. This balance had been carried to the credit of the deficiency account, which at the beginning of the year stood at £10,753, thereby reducing it to £2177. Had it not been for the storm in Wharfedale, there would have been a few thousand pounds to the credit of the reserve fund. The total income on the gas-works account was £291,254, and the working and management expenses £236,914; giving a trade profit of £54,340. The charge for interest and sinking fund was £59,646, making a net loss of £5306. The previous year there was a net profit in this department of £3071. By comparison, therefore, the year's working was worse than the previous year by £8377. He did not wish to create imaginary fears; but a difference of £8000 between last year and the year previous should make them pause. Last year, in speaking of the slender prospect there was under present conditions of meeting expenditure during the year, he said that both tar and coke would yield less by a good many thousands than in the previous year; and this, with other considerations, such as a possibly decreased consumption of gas, pointed to the importance of devising some means of obtaining additional revenue—otherwise at the end of the year a loss instead of a profit would have to be declared. He also said he had a shrewd suspicion that the gas-works, with their present charge of only 2s. 1d. per 1000 cubic feet, would during the current year barely make ends meet. This forecast had been verified; and he thought it called for a revival of the question which had on several occasions been taken up, but never seriously dealt with —namely, the price at which gas should be sold. What security had the Council that the bye-products would realize more next year than this year? The gas undertaking should not be obliged to rely upon bye-products in order to make ends meet. He did not suggest an extravagant price per 1000 cubic feet. Enormous profits were not required; but gas should be sold at a price which would enable the department at least to pay its way, without being at the mercy of the market for residuals. Direct taxation was an admirable and worthy principle; but it could be abused and overstrained, and so far as it obtained with regard to the price of gas, he suggested that last year's figures indicated that the principle had been over-weighted and pressed to breaking strain. They had actually sold at below cost price. If the incentive to municipal trading was the piling up of vast sums as profits wherewith to relieve the rates, he had no sympathy with it. Such a policy was likely to engender prodigality in other directions; but surely the happy medium might be found. If an object-lesson on this point were needed, it was ready to hand in the action of Parliament this session in the case of the Salford and Oldham Bills. Big profits for the relief of the rates were the order of the day; but Lord Donoughmore's Committee limited the appropriation of profit in relief of the rates to 1 per cent. on the outstanding capital. Invested capital was undoubtedly meant, though the word "outstanding" was used. He believed Salford had withdrawn their Bill in consequence of this limitation to 1 per cent.—having been accustomed, like many other towns, to appropriate a good deal more. Years ago Bradford ceased to charge high prices with the specific object of profit-making to relieve poundage rates; but in their eagerness to demonstrate the justice of a principle, they had been unconsciously carried towards the other extreme. The decision of Lord Donoughmore's Committee was one with which the majority of the members of the Council would be in agreement. If

applied to Bradford, it would mean that, with an invested capital in the gas-works of £1,163,735, prices should be so adjusted that, instead of a loss of £5000, there would remain a margin of £11,000 for the steadying of poundage rates or other contingencies. An increase of 2d. per 1000 cubic feet should be tried, making the price 2s. 3d., less 2d. discount. The charge was at one time 3s. 6d. The question would have to be dealt with; and, personally, he would not hesitate to move a resolution. One per cent. upon invested capital was a margin for purposes of adjustment and contingencies which could not be regarded as extravagant; and he saw no reason why it should not be made to apply to every trading undertaking in the Corporation. Ratepayers were the shareholders in these concerns; and to them would revert any surplus over and above the amount required to level-up deficiencies or to relieve rates under special circumstances.

Mr. JOHN LUND pointed out that, while there had been an increase in the consumption of gas in the outer districts of the city, there had been a marked decrease in the centre. The deficit of £5000 on this department, he said, was probably due to bad trade and the competition of electricity. But when he looked at the Electricity Committee's receipts and expenditure, he was surprised to find a surplus of only £2147, against £9700 in 1904 and £8709 in 1905. He suggested that the control of the Gas and Electricity Departments should be placed in the hands of one Committee; for thereby the competition between the two and their capital expenditure might be regulated.

Mr. HORACE GELDARD (the Chairman of the Gas Committee) said that his department had suffered through the increase in the price of coal. Since the undertaking was municipalized, it had produced nearly £500,000 for the relief of the rates; and the very first year it showed a deficit, the Council's "Chancellor of the Exchequer" was crying out for an increase in the price paid by consumers. The Gas Committee were paid £26,000 a year for street lighting; and the addition of 2000 lamps had not been followed by an increased payment. Street lighting cost the Gas Committee nearly £31,000 a year at present; and the deficit would have almost been wiped out if the Gas Committee had been fully paid for street lighting. The great burden that the gas undertaking had to bear was due to the interest and sinking fund charges in respect of the purchase of the gas-works in the outlying districts of the city. He could not understand the suggestion of Mr. Wade that the Gas Department should be made to pay without having to rely on residuals, when residuals alone realized between £60,000 and £70,000. He admitted that electricity was a great competitor of gas, but said he was confident that next year the gas-works would be made to show a profit.

The Finance Bill and Land for Water-Works.—In Parliament last Tuesday, Mr. Samuel Roberts asked whether land acquired by local authorities for water-works purposes or for protecting their area from pollution will be exempted from the provisions of the land clauses in the Finance Bill. In reply, Mr. Hobhouse said Clause 24 (1) of the Finance Bill provides that no duty under Part I. shall be charged in respect of any land or interest in land held by a local or rating authority.

BURY CORPORATION GAS UNDERTAKING.

In the course of their report on the Bury Corporation accounts for the year ending March 31, the Auditors (Messrs. Merchant and Son), referring to the gas undertaking, make the following remarks.

The price of gas for the past year has been 2s. net per 1000 cubic feet, as compared with 1s. 11d. net for the previous year. The profit for the past year has been £18,520. The reserve fund, after adding the bank interest for the past year, stood at March 31 at £5032. As the statutory limit is £5000, the excess of £32 has been transferred to the revenue account, making together £18,552. Out of this has been provided interest and dividends on loans and stocks, £6466; sinking fund, £6313; and reserve fund, £52, leaving a net profit of £5721, one moiety of which—namely, £2860—has been transferred to the general rate, and the remaining moiety has been credited to the consumers in reduction of the price of gas for the current year.

The capital outlay upon works at March 31, 1908, was £304,189. The further outlay during last year comprised: Buildings, £568; plant and machinery, £3382; mains, £1354; stoves, £646; and railway siding, £815 10s. 7d. Thus the total outlay to March 31 was £310,954. The stock of materials, including meters and fittings, is valued at £15,890; the amount owing by sundry persons for gas and meter rents and residuals is £17,319; and the investments with other corporations amount to £14,300. The total assets are therefore £358,463. The liabilities are: Loans on mortgage and redeemable stock, £177,006; creditors, £13,648; and bankers, £14,269. There were therefore at March 31 last surplus assets of £153,540. This surplus has been effected by setting aside out of revenue to sinking funds for the purpose of paying off loans and redeeming stock the sum of £148,540; and the reserve fund of £5000.

NEW PLANT AT TIVERTON GAS-WORKS.

The new plant which has been installed at the Tiverton Gas-Works was formally inaugurated last Friday. The Mayor (Mr. H Mudford) and the members of the Corporation attended at the works, and the improvements which have been effected were pointed out to them by Mr. Clark Jeffrey, the Gas Manager. In large measure, the works have been reconstructed. New retorts have been erected on the regenerative principle, and a new gasholder, washer-scrubber, purifiers and boiler, and engine installed, while a new meter-house and governor-house have been built and the yard extended. As some of the visitors remarked, a complete transformation has been made in the works during the last few years—all tending to greater economy and efficiency in working. The manufacture and erection of the plant have well been carried out by Messrs. Willey and Co., of Exeter, to the designs and under the superintendence of Mr. Clark Jeffrey. In the new washer-scrubber and purifier, there is now ample space for dealing with the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 745.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	17¾—18¼	..	5 9 7
298,955	10	,,	7	Do. 7 p.c.	12¾—13¼	..	5 5 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98		4 0 0
200,000	5	May 27	6½	Bombay, Ltd. . . .	5¾—6	+⅛	5 8 4
40,000	5	,,	6½	Do. New, £4 paid .	4½—4¾	..	5 9 6
50,000	10	Aug. 26	15	Bournemouth Gas and Water } 10 p.c. . .	28—28½	..	5 5 3
311,810	10	,,	7	Do. } B 7 p.c. .	16¼—16¾	..	4 3 7
75,000	10	,,	6	Do. } Pref. 6 p.c.	15⅜—15⅝	..	3 16 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	252—255	+1	4 18 0
300,000	,,	,,	9½	Do. New . . .	190—192	..	4 19 0
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122	..	4 2 0
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	100—102	..	3 18 5
220,000	Stk	Sep. 10	11	Brighton & Hove Orig.	208—213*	..	5 3 3
246,320	,,	,,	8	Do. A Ord. Stk. .	150—152*	..	5 5 3
460,000	20	Apl. 16	10	British	43—43½	..	4 11 11
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c. . .	117—119	..	5 0 10
165,700	,,	,,	4½	Do. B 3½ p.c. . .	88—90	..	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c. . .	106—108	..	5 1 10
55,000	,,	June 25	3½	Do. 3½ p.c. Deb. .	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13¾—14¼	..	4 18 3
250,000	Stk.	June 25	4	Do. 4 p.c. Deb. .	95—97	+1	4 2 6
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord. . .	106½—108½	..	4 12 2
1,493,280	Stk.	Aug. 26	5$\frac{2}{10}$	Commercial 4 p.c. Stk. .	108—110	..	4 14 7
560,000	,,	,,	5	Do. 3½ p.c. do.	104—105	+1	4 14 4
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	95—97	..	5 3 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
492,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord. .	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd. . . .	24½—25	..	4 16 0
354,060	10	,,	12	Do. £7 10s. paid.	18½—19	..	4 14 9
15,141,545	Stk.	Aug. 12	4⅔	Gas light and Coke } 4 p.c. Ord. . .	105½—106½	+1	4 7 7
2,600,000	,,	,,	3½	Do. } 3½ p.c. max. . .	88—90	+1	3 17 9
3,799,735	,,	,,	4	Do. } 4 p.c. Con. Pref.	103—105	..	3 16 2
4,193,975	,,	June 11	3	Do. } 3 p.c. Con. Deb.	86—87	..	3 8 11
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92—94*	+1	5 6 4
82,500	,,	,,	6½	Do. do. 5 p.c.	117—119*	+1	5 9 3
70,000	10	Apl 29	11	Hongkong & China, Ltd.	17¾—18¼	..	6 0 7
131,000	Stk.	Sep. 10	6½	Ilford A and C . . .	138—140*	..	4 12 10
65,780	,,	,,	5	Do. B	105—107	+1	4 13 6
65,500	,,	June 25	4	Do. 4 p.c. Deb. . .	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental .	179—181	..	4 8 5
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 11

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c. .	119—121	+1	4 19 2
561,000	Stk.	,,	10	Liverpool United A .	223—225	..	4 8 11
718,100	,,	,,	7	Do. B . .	165—167	..	4 3 10
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean .	4⅞—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met of Melbourne } 5 p.c. Deb	102—105	.	4 5 2
250,000	100	,,	4½	Do. } 4½ p.c. Deb.	102—104	..	4 0 7
541,920	20	May 27	3½	Monte Video. Ltd. .	12¾—13¼	..	5 5 8
1,775,892	Stk.	July 29	4½	Newc'tle & G't'sh'd Con	106—108	+½	4 3 4
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	92—93	..	3 12 2
55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	139—141	..	5 13 6
60,000	5	Sep. 10	8	Ottoman, Ltd. . . .	6—6¼*	+⅛	6 7 9
31,800	53	Aug. 26	13	Portsea Island A. . .	137—139	..	4 19 0
60,000	50	,,	13	Do. B. . .	129—131	..	4 19 3
100,000	50	,,	12	Do. C. . .	120—123	..	4 17 7
114,800	50	,,	10	Do. D and E.	101—103	..	4 17 1
398,490	5	May 13	7	Primitiva Ord. . . .	7—7¼	..	4 16 8
796,980	5	July 29	5	Do. 5 p.c Pref. .	5¼—5½	..	4 10 10
488,900	100	June 1	4	Do. 4 p.c. Deb. .	94—96		4 3 4
1,000,000	10	Apl 29	8	River Plate Ord. . .	16¾—17¼	..	4 12 9
312,650	Stk	June 25	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	14¼—14¾	..	5 8 6
62,500	10	,,	6	Do. 6 p.c. Pref. .	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49½—50½	..	4 19 0
135,000	Stk.	Sep. 10	10	Sheffield A	229—231*	+3	4 6 7
209,984	,,	,,	10	Do. B	229—231*	+3	4 6 7
523,500	,,	,,	10	Do. C	229—231*	+3	4 6 7
70,000	10	June 11	10	South African . . .	13½—14	..	7 2 10
6,429,895	Stk.	Aug. 12	5⅓	South Met., 4 p.c. Ord.	119—121	..	4 8 1
1,895,445	,,	July 1	3	Do. 3 p.c. Deb.	85—86	..	3 9 9
209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	153—155	..	5 3 3
605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	118—120	..	4 11 8
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord. . .	111—113	+1	4 8 6
120,000	Stk.	Aug. 12	6⅞	Tottenham and Edmonton } A 5 p.c. .	133—135	+1	5 1 9
453,940	,,	,,	5⅜	Do. } B 3½ p.c. .	111—113	+1	4 15 3
149,470	,,	June 25	4	Do. } 4 p.c. Deb.	100—102	..	3 18 5
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109—111	..	4 10 1
255,636	Stk.	Aug. 26	6⅝	Wandsworth } B 3½ p.c. . .	138—140	..	4 14 8
79,416	,,	June 25	3	Do. } 3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	,,	Aug. 12	5⅜	West Ham 5 p.c. Ord. .	124—126	..	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref. . .	127—129	..	3 17 6
253,300	,,	June 25	4	Do. 4 p.c. Deb Stk. .	112—114	..	3 10 2

Prices marked * are "Ex div."

present maximum make of gas with a margin for future increase. The gasholder has a capacity of 110,000 cubic feet. By the removal of some old buildings, and the erection of the meter-house and governor-house in a new position, the general appearance of the works is much improved; and more space is afforded for dealing with the coal supplies and stacking coke. A steam-engine and boiler have been installed for the generation of power; but the gas-engine hitherto used is retained as a stand-by.

The Mayor inaugurated the works by beginning the charging of one of the new retorts, for which purpose he was handed by the Manager's son a new shovel, the handle of which was wrapped with coloured ribbons. Several members of the Council followed, and added a few shovels full of coal to the charge.

After this ceremony and the completion of the inspection, the Mayor and Mayoress entertained the Council and visitors to tea, which was laid in the meter-house. Alderman J. Thorne, the Chairman of the Lighting Committee, expressed pleasure at the presence of Mr. Depree, the Chairman of Messrs. Willey and Co., and paid a high tribute to the firm for the effective way in which they had carried out the work. Mr. Depree acknowledged the references to himself and his firm, and remarked that the plans and specifications prepared by Mr. Clark Jeffrey were very clear and had been admirable to work to. Alderman Thorne afterwards proposed a vote of thanks to the Mayor, and said that since the gas-works were purchased by the Corporation in 1895, great progress had been made. Including the purchase money, the total outlay up to March 31 last had been £32,000. They had a sinking fund of over £14,000, and a reserve fund of £3000; so that they had practically paid off over £17,000, and in about six years would have paid off the original capital debt. If they had been a private Company, they could have paid a dividend of about 9 per cent. After the debt was extinguished, gas would be very much cheaper; and there would be something to go towards the expenses of the town. They were largely indebted to Mr. Clark Jeffrey for the excellent results achieved. Mr. Deering, who was first to suggest the purchase of the gas undertaking by the Council, seconded the vote of thanks; and the Mayor, in acknowledging it, complimented Tiverton on having one of the most up-to-date gas-works in the West of England. The services of the Gas Manager were also formally acknowledged.

East-End of London in Darkness.—We learn from the "Daily Mail" that some excitement was caused in the East-End of London late last Wednesday night, when the whole of the electric light in Stepney and Whitechapel suddenly failed; the districts being plunged in total darkness, except for a few street flares and shop lamps. After about three minutes, the light again appeared. At the Pavilion Theatre, Shoreditch, a sun gas-burner in the dome of the auditorium was the only illuminant for some minutes; and there was considerable excitement among the audience. The failure was due to a "slight mishap" at the Borough Council electric generating station at Stepney.

LABOUR AGITATION IN LEEDS.

On Sunday afternoon, the Leeds District of the National Union of Gas Workers and General Labourers celebrated their twentieth anniversary; a crowded meeting being held in the Queen's Theatre.

The chair was occupied by Mr. W. H. Leach, the President of the Trades Council, who reviewed the progress of the Union from the inauguration, and said that now they had 250 branches in Great Britain and Ireland, with 40,000 members, comprising seventy different sections of workpeople. They had four members of Parliament in their ranks. No other Union had been called upon to deal with so many strikes and lock-outs; the reason being that their members worked with members of so many other Trades Unions. He was glad to say, however, that they had weathered the disputes better than most other Unions. During the past two years, they had dealt with 859 legal cases; and they had recovered £20,827 in actions for compensation and wages. Since the Compensation Act came into force, a total sum of £78,219 had been secured for their members; while since the establishment of the Union, they had paid no less a sum than £127,388 for strike, lock-out, and victim pay.

Mr. J. E. Smith said that in Leeds the Union were face to face with a position which was becoming absolutely intolerable. They had not had a single strike in their district during the last twelve years; but this was due rather to the combination they had secured among their workers than to the attitude of the employers. He believed strongly in conciliation; but they must have it from both sides of the table. They had reached a state of affairs in connection with the Municipality under which the members of the Union would not allow them to continue. The word had gone forth from Alderman Wilson to the Consultative Committee that no advances were to be given to any of the men applying. They did not believe in lavish expenditure; but they did not want economy always at the lower-paid workers. This was what was being done by the Leeds Corporation. He would go further, and say that if it had not been for combination the position of the Leeds municipal workers, bad as they were, would have been fifty times worse. They were there to say that, if they had to fight, the old fighting spirit of 1890 could assert itself again. Recently the Water Committee were convinced by a deputation from the Union that certain concessions were just, and they decided to grant them; but Alderman Wilson put his foot down, and said the concessions should not be granted. The Leeds Corporation to-day were harder taskmasters than private employers, when the Corporation ought to be a model. For two years they had been striving to obtain a maximum of 6d. per hour in the Sanitary Department; but it was stated that youths were now being set on to do work hitherto done by men, at a considerable decrease in wages. Further, there was an attempt in all the departments to throw the old men on to the industrial scrap-heap. If their Union stood for anything, it was to protect those who were not able individually to help themselves. The strike was the last weapon that ought to be used; but

if they were forced into the corner, he would neither ask for, nor was he prepared to give, quarter.

Mr. Will Thorne, M.P., said that if they wanted to minimize unemployment, a reduction of hours would have to take place in all parts of the country. The rapid transformation in methods of production, and the utilization of labour-saving devices, had made it possible to supply the demands of trade much quicker than before. He hoped that demonstrations would be organized in all industrial centres with the object of bringing about this reduction of hours. Alluding to the Leeds trouble, he asked why they should blame Alderman Wilson. Who returned Alderman Wilson? They had had enough striking. They wanted to strike a little harder at the ballot-boxes.

Mr. Pete Curran, M.P., said that if the Leeds Corporation insisted on a quarrel, at the final stroke they would prove that they were more powerful and more capable of fighting to-day than they were in 1890. They were completely solvent; and they were fearless of any corporation or private employer. They were prepared to discuss questions amicably; but if deaf ears were constantly turned to reasonable appeals, there would be nothing left for them but to use the last weapon at their disposal.

SALFORD'S WITHDRAWN BILL.

Action of Authorities Affected by Gas Clauses.

Representatives from the Local Authorities in the area of the Salford Corporation gas supply held a conference in Manchester last Tuesday to consider—first, what steps should be taken to secure the benefits of the clauses inserted by the Lords Committee in the Bill recently promoted by the Salford Town Council for a reduction in the illuminating power and for sanction to borrow further capital for the undertaking; and, secondly, the following resolution passed by the Salford Town Council on the 1st inst.: "That the Council be recommended to authorize the Gas Committee to enter into negotiations with the out-districts with regard to the supply of gas; and, in the event of a reasonable understanding not being attainable, to intimate that the Council will seek relief from the obligation to supply."

It will be remembered that, following the Lords Committee's decision, the Corporation decided to drop the Bill; it being held that the acceptance of the clauses inserted by Lord Donoughmore's Committee would mean that the Corporation's power to make a profit out of the gas undertaking would practically be taken away.

The proceedings at the conference last Tuesday were private; but it has transpired that two resolutions were unanimously passed, as follows: "(1) That the Town Clerk of Eccles, the Clerk of the Swinton District Council, the Clerk to the Worsley District Council, and the Clerk to the Barton Rural Sanitary Authority should take Counsel's opinion on the question of enforcing upon Salford the concessions granted to the out-districts by the Lords Committee;" and "(2) that any negotiations with the Salford Gas Committee must be with the whole of the authorities at one time."

A Ratepayer's Criticism.

Addressing a meeting held at The Height last Wednesday, Mr. A. E. Jennings, a ratepayer, entered upon a criticism of the Salford Gas Committee's management of the undertaking. Incidentally, he made a comparison between municipal gas undertakings and private gas companies. He pointed out that, while the price of gas at Nottingham and Bolton, for example, was 2s. 6d. per 1000 cubic feet, in Bristol, Newcastle, and Sheffield (with private undertakings) the charges were respectively 2s., 1s. 9d., and 1s. 4½d.

TAUNTON ELECTRIC LIGHT UNDERTAKING.

At the Monthly Meeting of the Taunton Town Council last Tuesday—the MAYOR (Alderman J. G. Price) presiding—the Electricity Committee reported that they had considered the letter recently received from the Taunton Chamber of Commerce, and the report which accompanied it, questioning the financial soundness of the undertaking as shown by the published annual statement of accounts, and asking for certain information "in order to dispel the existing feelings of uneasiness and lack of confidence." The Committee did not recognize that there were any feelings of uneasiness and lack of confidence on behalf of the ratepayers generally; and they proposed to inform the Chamber of Commerce that the undertaking was carried on to the satisfaction of the Local Government Board, and the accounts were kept in conformity with the Board of Trade regulations and the Electric Light Orders Confirmation (No. 4) Act, 1893. If, therefore, the Chamber of Commerce desired to go further into the matter, they had better apply to the Local Government Board for an expression of their opinion.

Dr. MACDONALD, the Chairman of the Electricity Committee, in moving the adoption of the report, said the Committee felt that no advantage would be gained by publicly discussing this matter at the Town Council meeting, inasmuch as they carried on the electric light undertaking exactly in accordance with the requirements of the Local Government Board. The Committee therefore felt that they were doing the best they could for the town; and the only suggestion they could make was, as stated, for the Chamber of Commerce to apply to the Local Government Board if they required further information. The Committee would help them in every possible way in obtaining it.

Councillor STANDFAST thought this was rather a curt way of replying to the Chamber of Commerce, as they all knew what sort of Local Government Board they had at the present time. The speaker characterized the Board of Trade as a "brimstone and treacle" body.

There being no further criticism, the report of the Committee was adopted.

EXMOUTH WATER SUPPLY.

Another Bill to be Promoted.

It is again proposed by the Exmouth District Council to seek parliamentary powers for works of water supply. Last year, a majority of the ratepayers voted against a similar proposal; but since that time it has been proved that an abundant supply of water is to be obtained from the borehole at Dotton which was sunk at the suggestion of Mr. G. H. Hill, the Engineer, and Professor Boyd Dawkins, whose advice was sought by the Council. In view of this practical demonstration of the accuracy of the experts' forecast, it is anticipated that the ratepayers will now be found in favour of the scheme, in spite of its not inconsiderable cost.

Mr. Hill and Professor Dawkins attended a meeting of the Council last Tuesday, for the purpose of answering questions put by opponents of the scheme. Mr. Hill, in reply to some of the queries, said the surface of the water in the well was about 32 feet above the level of the sea, and there was not the least indication in the analysis of contamination by sea water. During the experimental pumping, they obtained nearly a million gallons a day for a fortnight, which was more than three times the quantity they expected. Every possible scheme for the supply of the town had been considered; and this was the only feasible one. Professor Dawkins said he should like to amplify the last remark. There was no alternative scheme possible in this case, because there was no other site which at all equalled the one at Dotton. They had there a very large supply of good water, which did not interfere with any existing supplies of other places. Mr. Hill added that the scheme was cheaper than an impounding reservoir or any other method would be. Reservoirs were extremely uncertain things; and the contingencies were vastly in excess of anything in connection with a pumping scheme. Mr. Daw, the Chairman of the Water Committee, pointed out that the question of the shortness of water had been under consideration for three years; and to-day they were in no better position than at the beginning, so far as the actual supply was concerned. Those who opposed the present scheme put forward no alternative; while to go on as they were, was to court disaster.

On a vote being taken, it was decided by eleven to five that the necessary steps be taken for the promotion of a Bill in the next session of Parliament to carry out the scheme.

Charge to Prepayment Consumers at Mansfield.—There was some discussion in the Mansfield Town Council with reference to a recommendation of the Gas Committee that, as from the 1st prox., the price of gas for lighting purposes should be reduced from 2s. 8d., 2s. 6d., and 2s. 4d. per 1000 cubic feet to 2s. 6d., 2s. 4d., and 2s. 2d. One member expressed the opinion that the prepayment-meter users were entitled to further consideration; and on his proposition, the matter was referred back to the Committee.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

When a copy of the annual accounts of the Edinburgh and Leith Gas Commissioners was submitted to the Town Council of Edinburgh on Tuesday of this week, Mr. Bruce Lindsay called attention to the extreme difference between the charges made by the Gas Commissioners for gas supplied by prepayment and ordinary meters. In Dundee, he said, the extra charge for gas supplied through prepayment meters was 5·4d. per 1000 cubic feet; in Glasgow, 7d.; while in Edinburgh, it was 1s. 2d. He maintained that the arguments upon which the difference in price was based were fallacious, and suggested that the Gas Commissioners did not desire to encourage the consumption of gas through prepayment meters. The Corporation should impress upon their representatives in the Gas Commission to pay particular attention to the matter, so that the poorer classes should not be penalized. Lord Provost Gibson assured Mr. Lindsay that the Gas Commissioners had always sought to encourage the use of prepayment meters. The reason for the higher charge was not as stated by Mr. Lindsay, but because of the loss sustained in the working of the meters, which was considerable. Several members of the Council, who are also members of the Gas Commission, explained that the subject was before the Gas Commission, and referred to the report upon it which was presented to the Commissioners in July last (see *ante*, p. 195), in which Mr. Herring, the Engineer, gave his opinion that the extra charge of 1s. 2d. was justified. The price of gas was being considered at the present moment. Mr. Lindsay expressed himself as satisfied if the Commissioners had had the matter before them.

On behalf of the Cleaning and Lighting Committee, it was explained to the Musselburgh Town Council on Tuesday that offers by the local Electric and Gas Companies for the lighting of the main thoroughfares of the town had been considered, and that the Committee recommended the acceptance of the offer of the Gas Company, which was £95 less than the other. They had no fault to find with the present lighting by electricity; but the question was whether it was worth about £100 a year more than gas lighting. Electric lighting, it may be stated, was adopted five years ago. Provost Simpson opposed the recommendation of the Committee, and declared that to revert to gas lighting would be a retrograde step. The question of whether shareholders in the Gas Company would be entitled to vote on the matter was raised; and the Town Clerk, who is also Secretary to the Company, ruled that they could not. An equal number voted on each side; and Provost Simpson gave his casting vote in favour of electricity, which will accordingly continue to be used in public lighting.

In the Hamilton Town Council on Tuesday, ex-Provost Keith, in moving the adoption of the estimates and rates for the year, said that while the special surplus which they had received from the Gas Department—£3000—in itself admitted of over 3d. reduction, the municipal assessments were gradually going up. The special credit from the Gas

Department had come in at a very hard time, so far as the ratepayers were concerned, and had enabled them to make a small reduction. Bailie Smellie moved that the assessments be reconsidered. He thought that while they had gone a good length in applying £3000 from the gas profits in relief of rates, they might do better, and grant (say) another £1000 or £1500. Bailie Cassells seconded. He considered that the money lying in their hands was the property of the ratepayers, and it ought to have been divided long ago. On a division, the amendment was carried by a majority of one, and the assessments were sent back to the Committee for reconsideration.

In the Arbroath Town Council on Monday, the estimates for the current year were approved. The income is put at £16,011, and the expenditure at £15,852; leaving a profit balance of £159.

The Alyth Town Council on Monday evening were in a querulous mood over the subject of coal gas getting into the water-pipes. The question was introduced by a letter from a resident who complained of "the quantity of gas in the water-pipes" in his house at Airlie Mount. Ex-Provost Tod explained that when the water was shut off the gas, if there were any escape near by, got into the pipes at the hydrants; and Airlie Mount being one of the highest points in the town, the gas was bound to be worse there than lower down. Councillor Lowrie maintained that the same trouble existed at the Market Square, which was certainly not a high point. Bailie Sandilands said that ever since he went to Alyth he had had the same thing to complain of when the water was shut off. He moved that the Gas Company be asked to put their pipes in proper repair. Councillor Robertson considered that it was an impossibility for coal gas to enter a water-pipe at a hydrant. He asked them not to let such a ridiculous and absurd statement go out to the public. The Council eventually adopted the resolution to bring the matter under the notice of the Directors of the Gas Company.

In the Broughty Ferry Town Council on Monday, the Gas Manager—Mr. G. Keillor—reported with reference to the scheme of valuation of the gas-works adopted by the Assessor this year. He said depreciation would not be allowed under any circumstances in respect of gas and water undertakings. Only allowances on *bonâ fide* renewals as and when effected would be conceded. The scheme was most inequitable, and, while not affecting the Electric and Tramway Departments, would seriously affect the Gas Department. He suggested that gas undertakings should be assessed in accordance with the various Revenue Acts, and not a departmental order, as the new memorandum by the Assessor seemed to be. The Council resolved in accordance with the opinion of Mr. Keillor.

During the year to May 15 last, Mr. S. W. Lawson, the Gas-Meter Inspector to the Corporation of Perth, tested 344 gas-meters, of which 324 were found to be correct, and 20 were rejected as incorrect.

In the Newport (Fife) Town Council, on the 6th inst., Bailie Young, the Convener of the Gas Committee, moved that the price of gas for the year be fixed at 3s. 9d. per 1000 cubic feet, being a reduction of 1d.; that meter and stove rents be abolished; and that £250 be added to the reserve fund. He paid a tribute to the splendid services of the Gas Manager—Mr. John F. Black—and to the co-operation which he himself, as Convener, had received from the Town Council. Provost Robertson, in seconding, said the abolition of meter-rents was equal to a reduction of 3d. per 1000 feet. The motion was adopted.

The public lamps in the village of Crossgates were lighted for the first time on Thursday evening and, it is stated, gave great satisfaction. The gas is supplied by the Cowdenbeath Gas Company. The lamps are controlled by Messrs. Alder and Mackay's patented device, by means of which the whole of the lights are turned up in a few seconds. The Gas Company have opened a depôt in the main street, where they make a brilliant display of lighting.

The office of the Dundee Corporation Gas Department is being transferred from Commercial Street to Irvine's Square. A new edifice has been erected there to accommodate the commercial headquarters, and also the meter, piping, and lighting departments of the undertaking. The new premises were inspected yesterday by a Sub-Committee of the Gas Committee.

A special meeting of the Town Council of Aberdeen was held on Wednesday to deal with a recommendation by the Water Committee to apply to Parliament next session for power to take a supply for the city from the River Avon. The report of the Water Committee, dated June 8 last, embodied the findings in a report to them by Sir Alex. R. Binnie and Mr. G. F. Deacon, who, during their investigations, were assisted by Dr. John Horne, F.R.S., of the Geological Survey of Scotland, and Dr. Hugh R. Mill, F.R.S.E., President of the Royal Meteorological Society. These experts recommended the formation of a reservoir in the valley of the Avon as the best permanent solution of the water problem. Their estimate of the cost was, for a first instalment of 10 million gallons a day, £1,068,000; and for a second instalment of 10 million gallons, £443,500—a total for 20 million gallons a day of £1,512,000. Lord Provost Wilson, in moving adoption of the report of the Committee, said that the present water supply was totally inadequate. The city was entitled, under present parliamentary powers, to draw only 8 million gallons a day from the River Dee. The storage capacity was barely two days' supply; and the carrying capacity of the aqueduct was 8 million gallons. Last year, in the month of June, on five occasions, the consumption rose to 8,195,000 gallons. The population of Aberdeen might be fairly stated at 175,000, and, allowing for an increase of 2500 per annum, the city, ten years hence, would have a population of 200,000, whose daily consumption would be considerably over 8 million gallons. The time had now arrived for making provision for a larger supply to meet the growing demands of the city. There was another and very cogent reason for steps being taken—and that speedily—to deal with the water supply, which was the condition of the aqueduct. This was designed to carry 6 million gallons per day. It was intended that it should be constructed of double brick, but, to save money, it was made of single brick, and was made to carry 8 million gallons a day instead of 6 millions. The water as at present delivered to the citizens was unfiltered, just as drawn from the river, except in so far as the heavier impurities had sunk to the bottom of the reservoir, or been

intercepted by screens. The water in the Avon was unpolluted, and would not require to be filtered, by which there would be an annual saving of £1825. It was moved, as an amendment, that before application be made for statutory powers, a plebiscite of the ratepayers be taken. It was argued, in support of it, that the present water supply could be augmented; that the existing pollution could be removed at small cost; and that the new scheme would impose a burden on the community which they would be unable to bear, and would discourage industry. In the course of the long discussion, it was mentioned that it was anticipated that a domestic water-rate of 1s. in the pound would be sufficient to meet the cost; but the opponents of the proposed scheme were confident that it would be necessary to impose a rate even as high as 1s. 7d. The Council adopted the scheme by 19 votes to 13.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Sept.* 18.

Although there has been continued good demand, supplies seem to have been more plentiful, and there has been no further appreciable improvement in values. The closing prices are £11 7s. 6d. per ton f.o.b. Hull, £11 8s. 9d. per ton f.o.b. Liverpool, and £11 10s. per ton f.o.b. Leith. There is still inquiry for delivery ahead; but buyers will not follow the advance, and no important business has transpired. For delivery up to the end of the year, £11 12s. 6d. f.o.b. best ports is quoted; and for delivery over spring months, £11 15s. per ton is asked.

Nitrate of Soda.

The market is quiet, and prices remain 9s. 6d. per cwt. for 95 per cent., and 9s. 9d. for refined quality.

Tar Products. LONDON, *Sept.* 20.

The markets for tar products have been steady throughout the past week, with the exception of creosote, which is rather dull. Pitch has been in good demand, and makers are holding for high prices; and some quantity is reported to have been sold on the east coast for prompt delivery at 29s. 3d. Creosote is quiet. There are not many orders just now, and in the North especially low figures are spoken of. Benzol, 90 per cent., is firm in London, where makers appear to be well sold. In the North they are willing to take $5\frac{3}{4}$d. per gallon, casks included, for delivery over the next three to six months; and even at this figure business is difficult. Benzol, 50 to 90 per cent., is firm; and the demand for toluol is good, especially in the North. Solvent naphtha is steady and in very good demand in London; and actual London makes appear to be decidedly short. Heavy naphtha is quiet, and there does not seem to be very much business doing. Carbolic acid is depressed; and Continental manufacturers decline to advance their limit owing to the poor demand for crystals.

The average values during the week were: Tar, 15s. 3d. to 19s. 3d. *ex* works. Pitch, London, 30s.; east coast, 29s. 3d. to 29s. 9d.; west coast, 28s. 6d. to 29s. 6d. f.a.s. Benzol, 90 per cent., casks included, London, $6\frac{1}{4}$d. to $6\frac{1}{2}$d.; North, $5\frac{3}{4}$d. to 6d.; 50-90 per cent., casks included, London, $7\frac{1}{4}$d.; North, $6\frac{3}{4}$d. Toluol, casks included, London, 9d.; North, $8\frac{1}{2}$d. Crude naphtha, in bulk, London, $3\frac{1}{2}$d. to $3\frac{3}{4}$d.; North, $3\frac{1}{4}$d. to $3\frac{1}{2}$d.; solvent naphtha, casks included, London, 11d. to $11\frac{1}{2}$d.; North, 10d. to $10\frac{1}{2}$d.; heavy naphtha, casks included, London, $10\frac{1}{2}$d. to $10\frac{3}{4}$d.; North, $9\frac{1}{2}$d. to $9\frac{3}{4}$d. Creosote, in bulk, London, $2\frac{5}{8}$d. to $2\frac{3}{4}$d.; North, $2\frac{1}{8}$d. to $2\frac{3}{8}$d. Heavy oils, in bulk, $2\frac{3}{4}$d. to $2\frac{7}{8}$d. Carbolic acid, 60 per cent., casks included, east coast, $10\frac{1}{2}$d. to $10\frac{3}{4}$d.; west coast, $10\frac{1}{4}$d. to $10\frac{1}{2}$d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, $1\frac{1}{2}$d. to $1\frac{3}{4}$d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been firm during the past week. The principal Gas Companies now quote £11 16s. to £11 11s. 3d. upon Beckton terms, and for January-June delivery £11 12s. 6d. to £11 15s.; but ordinary makes are selling upon Beckton terms at £11 2s. 6d. to £11 3s. 9d., while London f.a.s. terms are the same. The Hull value is about £11 3s. 9d. to £11 5s.; and in Liverpool £11 5s. to £11 5s. 3d. is asked. In Leith, manufacturers are very firm indeed in their ideas; quoting £11 10s. for prompt, and £11 15s. for January-June.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a little more activity in the coal trade; but prices do not show any rapid movement at present. In the steam coal trade, best Northumbrians are quoted from 10s. 10d. to 11s. 3d. per ton f.o.b. There is a steady inquiry for second-class steams; and the prices vary from 10s. to 10s. 6d. per ton. For steam smalls, the request is fair, and the price is from about 5s. to 6s. The collieries are working a little better than they have been; but the output is still scarcely normal. In gas coals, the home demand is now beginning to increase more steadily; and the exports are fair. Durham gas coal varies in price according to quality. The usual classes are from 10s. to about 11s. $1\frac{1}{2}$d. per ton f.o.b., and "Wear specials" up to about 11s. $7\frac{1}{2}$d. Forward sales are being made; and while about 11s. is offered for best gas coals over next year—at which a few sales were made a short time ago—up to 11s. $4\frac{1}{2}$d. per ton f.o.b. is now asked by some of the collieries who have a fair proportion of their output sold. Coke is firmer; and gas coke is influenced, even though the output is increasing. Good gas coke is quoted from 13s. to 13s. 6d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade remains as it was. There is no improvement in the home demand, and the foreign market is not strong, the most encouraging feature of it being inquiries which are being made for forward delivery. The prices now quoted are: Ell 8s. 9d. to 10s. 3d., splint 9s. 9d. to 10s.,

and steam 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 321,597 tons—an increase of 26,139 tons upon the previous week, but a decrease of 15,293 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,486,191 tons—582,196 tons more than the corresponding period.

The Bermondsey Explosion.—In regard to the gas explosion in Grange Road, Bermondsey, early in the present year, and the legal proceedings which have been instituted by the Bermondsey Borough Council against the Metropolitan Water Board, the South Metropolitan Gas Company, and the London County Council, negotiations have been opened between the parties; and in view of this, the trial of action has been postponed until the Hilary Sittings.

Gas-Mains and Motor Traffic.—At their monthly meeting, the Slough Urban District Council referred to the Highways Committee the following letter which had been received from Mr. Arthur Thomas, the Secretary to the Slough Gas Company: "I am desired by the Directors to write to you stating that very serious damage is being done to the Company's mains by the heavy traffic carried on by traction engines under the provisions of the Board of Trade's Heavy Motor-Car Order, 1904. The Directors feel that they must take some action to protect the property of the Company; and as large ratepayers in the urban district, they would be glad to know whether they would have the sympathy, and as far as possible the assistance, of the Council in the matter. The Directors also feel that it is a matter affecting the Council, and the ratepayers generally, as great damage is caused to the roads, and great discomfort, if not damage, to the houses, by this traffic."

Electric Light Failure at Sydney.—Electricity is evidently much the same all the world over. Sydney, we learn, has recently suffered from two failures of its electric lighting. The first was on a Sunday evening; and the second, on Friday, Aug. 13. The latter, which occurred at 6 o'clock in the evening, has roused "many indignant business people"—the indignation being presumably largely owing to the fact that, as reported by a local paper, no official explanation was forthcoming of the mishap. Streets were in darkness, as were also many shops, hotels, &c.; but a more serious aspect of the matter is one which it has unfortunately been previously necessary to draw attention in these pages. This is what the newspaper report says: "In addition to the inconvenience caused to business people, the failure of the light caused trouble at more than one hospital. At the Sydney Hospital an operation was being performed. Luckily, gas was available; and the operation was completed without harm to the patient by the delay which the failure of the light caused. There is no gas at the Children's Hospital, Camperdown; and candles took the place of the snuffed-out electricity. Nurses moved about with these feeble illuminators stuck hastily into the necks of bottles. The candles proved reliable." It is not pleasant to think of what might have happened at the first-named hospital had not the more reliable alternative gas been available.

Fatality at a Gas-Works.—A fatal accident of a somewhat strange character is reported from Neyland, in Pembrokeshire. It seems that a Mrs. Matthias shared the popular belief in the efficacy of a visit to a gas-works as a remedy for whooping-cough, and accordingly took her young son who was suffering from the complaint to the works which are used by the Great Western Railway Company for gas manufacturing purposes. While there, however, an explosion, from some cause or another, took place; and the consequent outburst of flame so severely burnt the mother that she died in a few minutes. A man named Garnett took the child from her arms; and in doing so, he was badly burnt. When the boy reached the Haverfordwest Infirmary, his condition was such that it was not expected he would recover.

The Gas Question at Sudbury.—A deputation of members of the Sudbury Town Council who recently interviewed the Directors of the Gas Company, reported that their arguments were listened to with great attention, and that, in reply, the Directors pointed out that they were about to seek a Provisional Order, or, if needful, a short Act of Parliament, which would be submitted to the Council in due course, as they were anxious to deal with the matter in a fair spirit and without antagonism to any existing authority. They further stated that, as they they had had the working of the gas undertaking such a short time in their hands—only since March last—they were unable for the present to make a greater reduction in the price of gas than that announced in their recent circular; but they hoped with a riper experience they would be placed in the happy position of being able to make further reductions. Any way, they had agreed that there should be inserted a clause in the Provisional Order providing for a maximum dividend, any profits beyond which would go to the reduction in the price of gas to the consumers.

The Lighting and Watch Act at Hellifield.—The President of the Local Government Board was asked in the House of Commons a few days ago by Mr. Clough whether he was aware that, under the Lighting and Watch Act, it was incumbent upon the Hellifield parish to have their annual meeting in October for the purpose of the administration of the Act; whether he had received a communication from the Hellifield Parish Council explaining that it was very inconvenient and unbusinesslike that the meeting should be held after the lighting season had commenced and contracts for gas and lamp-lighting had been entered into; whether the vote approving of these provisions for last year was only carried by the casting vote of the Chairman; and whether he could make an order altering the date of the parish meeting from October to September, or some earlier month, so as to render more smooth the working of the Lighting and Watch Act. In reply, Mr. John Burns said he had received a communication from the Parish Council to the effect stated in the question. He was not empowered to issue any order in the matter; but he was not aware of any objection to the parish meeting for determining the amount to be raised for the purposes of the Lighting and Watch Act, 1833, being held in September or some earlier month, if this was deemed convenient. He had informed the Parish Council accordingly.

Man Poisoned by Gas in Port Glasgow.—Last Wednesday John O'Carrigan, a butcher at Ballintoy, County Antrim, arrived in Scotland, and went to reside with a friend at No. 2, Springhill, Port Glasgow. Neither man was seen on Thursday; and in the evening neighbours informed the police, who effected an entrance to the house. In one of the rooms, in which there was a strong smell of gas, O'Carrigan was found in bed unconscious. He was taken to Greenock Infirmary, where he died on Friday morning, from the effects of poisoning by coal gas. The police theory is that the man blew out the gas light when he retired on the Wednesday evening.

Any Offers for the Robertsbridge Gas-Works?—Under date of the 15th inst., Mr. Henry G. T. Davies, the Receiver and Manager of the Robertsbridge, Salehurst, and Hurst Green Water and Gas Company, Limited (one of the No. 99, Cannon Street promotions), has issued a circular-letter stating that he was appointed by Mr. Justice Eve, on July 31, on behalf of the debenture holders, in an action brought by Mrs. Susannah Meadows, and that he is to act until Oct. 31. He adds: "I have taken possession, and am carrying on the business. As soon as possible, when the Courts re-open, I shall ask for permission to sell. Meanwhile I shall endeavour to obtain offers for the property which I can put before the Court. It would be useless to try to carry on the business without further capital for development, so that I do not think I can suggest any scheme of re-construction. If any debenture holder would be inclined to make an offer for the business, I shall be pleased to give particulars of the plant, &c."

A Secretary's Death from Gas Poisoning.—An inquest has been held at Henley-in-Arden upon the body of George Alfred Burton (aged 47), who was Secretary of the local Gas Company and of the Lodge of Oddfellows. Deceased was found in his office dead, apparently suffocated by gas. The evidence showed that Burton had failed to account for some of the gas funds, and was summarily dismissed. His father, who was guarantee for him, met the Company in a straightforward manner; and Burton made preparations for the handing over of the books and documents to his successor. He was discovered by his twelve-year-old daughter, who went to rouse him, thinking he was asleep. A piece of tubing, fixed to a tap, was found by deceased's chair. The Jury returned a verdict that death was due to accidental suffocation, caused by an escape of coal gas, and expressed their sympathy with the widow and six children. Mr. C. Couchman, J.P. (the Chairman of the Company), said until the unfortunate lapse Mr. Burton enjoyed the implicit confidence of the Directors.

Satisfactory Year at Falmouth.—Presiding recently at the annual meeting of the Falmouth Gas Company, Major F. Mead, the Chairman, congratulated the shareholders on the very satisfactory position of the undertaking. The report was the best he had known since the formation of the Company. They had 125 new customers during the year; and favourable contracts having been made for coal, the price of gas to ordinary consumers was reduced at Christmas last to 3s. 6d. per 1000 cubic feet. They were supplying a good article at a cheap price, and could look forward with confidence to the future. He believed gas was cheaper in Falmouth than anywhere else in Cornwall. Mr. W. Rowe, in seconding the adoption of the report and accounts, said that, by supplying cheap gas and free incandescent burners, they were conferring a benefit on the working classes, while also serving the interests of the shareholders. The balance-sheet, which showed a profit of £2542, was adopted; and the dividend of 5 per cent. declared—½ per cent. placed to the reserve fund, and ½ per cent. to the renewal fund.

Proposed National Smoke Abatement Movement.—A Smoke Abatement Conference was held at the Sheffield Town Hall last Tuesday, when the unanimous opinion was expressed that some decisive action should be taken to secure an abatement of the smoke nuisance. The opinion of the meeting seemed to be that the Local Government Board could do a good deal to remedy the evil by appointing inspectors to report on those local authorities who neglect their duty to the public by not enforcing their powers. After considerable discussion, the following resolution, proposed by Principal J. W. Graham, of Manchester, was passed: "That a Provisional Committee, with power to add to their number, be and are hereby appointed to consider the best means of promoting a strong national movement for furthering smoke abatement, and to carry on such work till a permanent organization can be formed; and that it be the first duty of such Committee to organize a deputation from the principal towns in the North and others to wait upon the President of the Local Government Board." It was also decided to form an Association to deal with the question of smoke abatement; Messrs. W. Basforth, of Sheffield, and F. Scott, of Manchester, being appointed Hon. Secretaries.

Salford Council and their Contracts.—An adjourned meeting of the Salford Town Council last Wednesday approved of a resolution amending one passed on Sept. 7, 1904, with reference to the payment of the standard rate of wages by persons obtaining Corporation contracts. In effect, the new resolution stipulates that the holders of a contract "must then and at all times during its execution be paying to the whole of their workpeople (except such as may be employed under special provisions agreed upon by the employers and the organized bodies of workers) the standard rate of wages in the several districts where their workpeople are actually engaged in the execution of work;" and must also be observing the recognized hours and conditions of labour, and must not prohibit their workpeople from joining trade societies or continuing members of such bodies. Mr. Purcell, who moved the resolution, said its object was to enforce that at all times the standard rate and the standard hours should be adopted by contractors tendering for work under the Corporation, also all other conditions of trade union labour. Alderman Phillips, the Chairman of the Gas Committee, expressed the opinion that there was no more dangerous matter to touch than that affecting the relation of employers and employed. He sympathized with all efforts to put the conditions of labour on a fair and equitable basis; but he did not think the Council were the right body to decide what was the custom of trade and what were the conditions of labour when the employers and employed themselves had not been able to do it. He was not prepared, however, to move an amendment to the resolution before the Council.

On the recommendation of the Highways Committee, the Carnarvon Town Council have agreed that the offer of the Gas Committee to supply tar free of cost for the purpose of experimenting on roads be accepted.

The Berkhamstead District Council lately considered a report from the Highways and Works Committee recommending a trial of Rostin controllers, with double inverted burners, for three months in the lamps in certain streets. The Chairman (Mr. Cooper) pointed out that this automatic lighting system had been working in Tottenham and Edmonton for some time, with satisfactory results.

The Bromley and St. Mary Cray Gas Company, after having tested about eighty of the "Gunfire" controllers for four years, have purchased, and have just completed fixing, these controllers to the whole of their lamps in the St. Mary Cray district; and last week the Calne Town Council renewed their agreement for the lighting of the whole of their lamps with the "Gunfire" controllers, after having used the system for about five years. Many other towns have done likewise, which, doubtless, will be accepted as ample proof of the success of this particular system.

Messrs. Timmis and Co., of Stourbridge, have prepared a very artistic catalogue to illustrate, by photographs, the various classes of goods they make from Stourbridge fire-clay, and to some extent the process of manufacture—thinking it may be helpful to both merchant and consumer to be able to familiarize themselves with the material they purchase, and the conditions under which it is raised from the earth and manufactured. Besides over thirty excellent reproductions of photographs of works, plant, and material, the catalogue contains a short account of the manufacture of fire-bricks, supplied by Mr. Timmis, by request, for use by the metallurgical students of the University of Birmingham.

The Topsham and District Water Company has been registered, with a capital of £3000, in £5 shares.

During the twelve months preceding June 30 last, the Keighley Corporation Gas Department made a net profit of £6191, out of which it is intended to use £5550 for the relief of the rates. It is proposed to reduce the price of gas by 1d. per 1000 cubic feet, making it 2s.

The ceremony of diverting the River Lea into a new channel took place on Saturday afternoon. The diversion was rendered necessary owing to the land through which the river flowed being required for the new Chingford Reservoir of the Metropolitan Water Board.

At a meeting of the St. Thomas Rural District Council last week, a letter was read from the Exeter Gas Company in reply to a complaint with reference to the laying of the gas-main at Alphington. This stated that notice was sent to the Surveyor on July 19, and the work was not commenced until July 23. The assertion therefore that the notice was given after the work was done, was incorrect. The statement made that the Company again broke up the road on Sept. 2 without notice was also wrong. The men were only repairing the existing trench. The Company had not the slightest desire to treat the road authority and their officials otherwise than with the utmost courtesy; and in practice they always wished to, and did, give due and proper notice for the opening of public roads. The Surveyor said the Company opened the road from side to side, and did more than was necessary to repair mains. He had had no notice of this. With regard to the other work, it had been on four days when he received notice. Mr. Maunder remarked that it was perfectly absurd of the Company to say that they were only repairing. They dug up the road, and laid fresh gas-pipes. The Clerk was directed to reply that the Council had nothing to withdraw, and hoped that such irregularities would not occur again.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

Gas Engineer and Manager. Carlisle Corporation. Applications by Sept. 25.
Accountant, &c. Merthyr Tydfil Gas Company. Applications by Sept. 28.
Traveller. No. 5138.
Stokers. Chertsey Gas-Works.

Situation Wanted.

In Laboratory. Hulbert, Westbury, Wilts.

Plant, &c. (Second-Hand), Wanted.

Washer-Scrubber. No. 5139.

Plant, &c. (Second-Hand), for Sale.

Station Meter. No. 5137.

Patent Licence.

Meters. Haseltine, Lake, and Co., Chancery Lane, W.C.

Stocks and Shares.

Ascot Gas and Electricity Company. Oct. 12.
Brixham Gas Company. Sept. 30.
Lowestoft Water and Gas Company. Oct. 12.
Southend Water Company. Oct. 12.
Tonbridge Water Company. Oct. 1, 1909.

Meeting.

British Gaslight Company. London Offices, Sept. 29, Twelve o'clock.

TENDERS FOR

Coke.

Sheppy Gas Company. Tenders by Sept. 29.

Engine and Exhauster.

Rhondda Gas and Water Department. Tenders by Oct. 1.

Fires and Cookers.

Skipton Gas Department. Tenders by Oct. 6.

Lead, Compo Pipe, and Tin.

Rhondda Gas and Water Department. Tenders by Oct. 1.

Purifiers, &c.

Birkenhead Gas Department. Tenders by Oct. 14.

Tar.

Market Harborough Gas Department. Tenders by Sept. 27.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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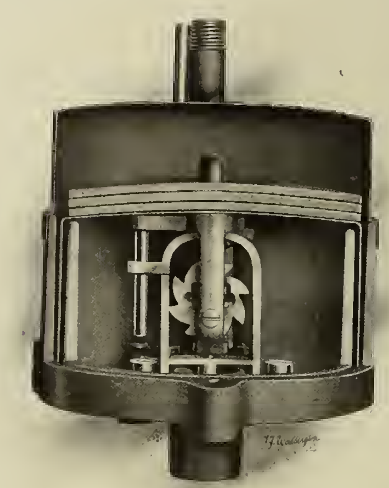

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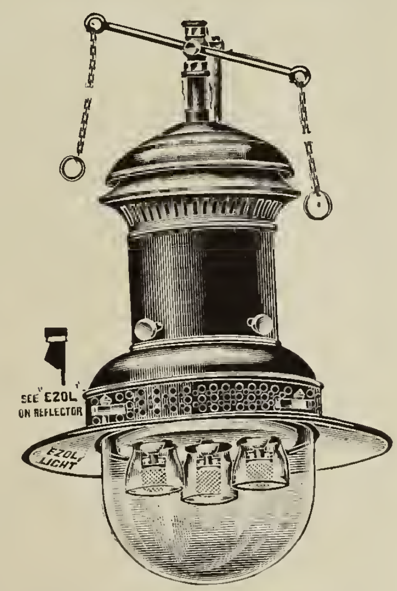
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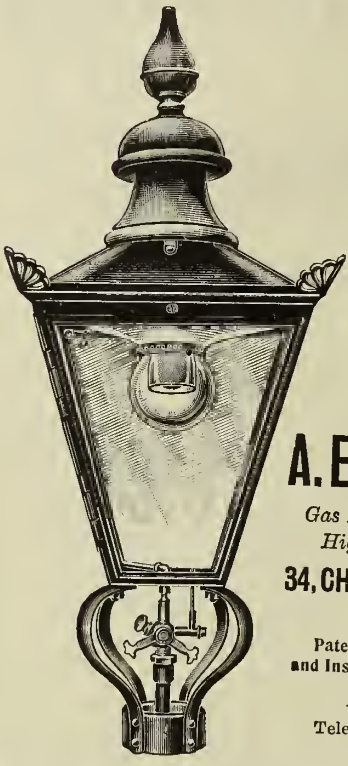

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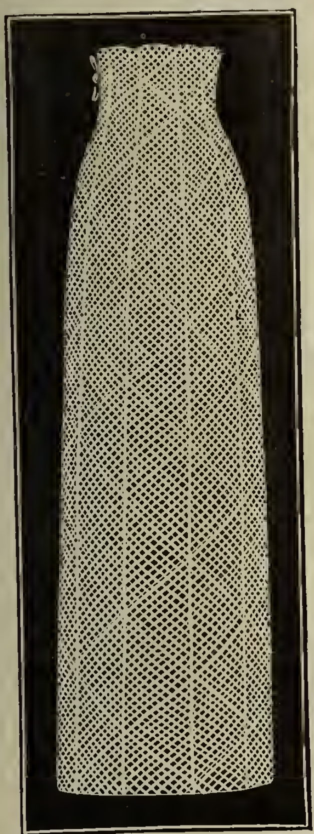

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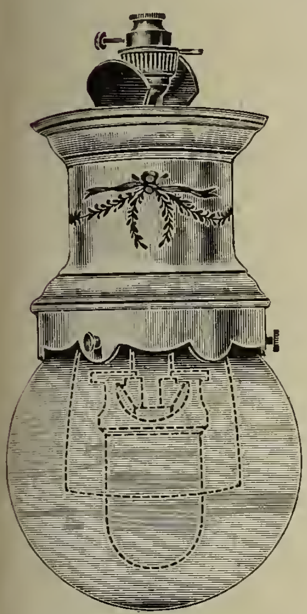

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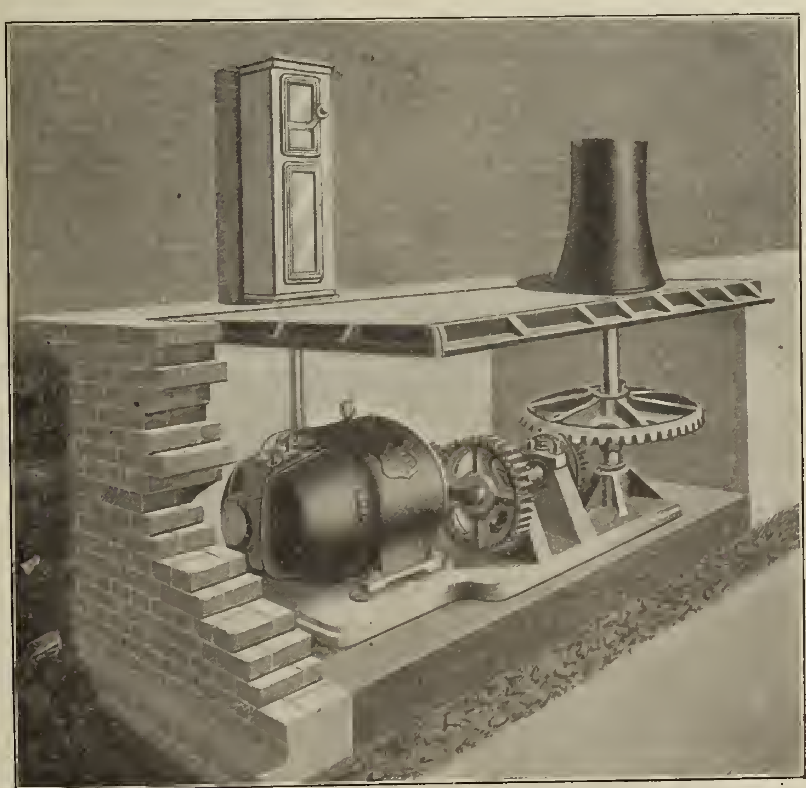

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CVII., No. 2420.——TUESDAY, SEPTEMBER 28, 1909.

EDITORIAL NOTES—GAS, &c.

Signs of the Times.

NOTHING could have been more thoroughly cordial than the reception that the members of the Eastern Counties Gas Managers' Association met with in Hull last week. The British Gaslight Company (whose Engineer and Manager in Hull, Mr. John Young, is the President of the Association for the year), the East Hull Gas Company (whose Engineer, Mr. John Holliday, supplied an instructive paper at the meeting), and the civic dignitaries and officials all combined to make the visitors feel that their presence in the city was heartily welcome, and that it was recognized that the objects of their conference and works' inspection possessed those characteristics that are, through technical and industrial endeavour, of eminent advantage to mankind generally. Though tempted to dwell on the kindness received on all sides at Hull, and on the excellent and helpful relationships existing between private gas enterprise in the city and the municipal authority (about which relationships his Worship the Mayor gave voice to some sentient observations at the opening luncheon), there are two or three other points to which attention must be given. The Presidential Address of Mr. Young at the meeting is dealt with in a succeeding article; and there is nothing that can be usefully said about the contribution Mr. Holliday made to the meeting, on "Gas-"holder Reconstruction," beyond a word of congratulation to him upon the thought and skill that find expression in the work that formed the basis of the paper, and which work was environed by difficulty of no mean degree.

The greater part of the business meeting was taken up by a discussion on Mr. W. J. Carpenter's paper, read last April, on "Gas Practices at Yarmouth," which opened up, in novel and attractive form, some fertile ground on those evergreen subjects that deal with the economics of gas administration on the trading side. There are certain salient points and lessons in the paper which the members did not fail to fasten upon in the discussion. They treat of the present position and the future needs of the gas industry. In his Presidential Address at the meeting of the Institution last June, and again last Thursday, Mr. Thomas Glover paid Mr. Carpenter the compliment of drawing special attention to the remarkable figures presented in the paper, supplied by a dissection of the day and night consumption at Yarmouth, and which brought out the extraordinary and gratifying knowledge that an equipoise has been established between the day and night consumption. Other gas engineers have since made similar observations; and the experience of Yarmouth has been found reflected in several other places—Norwich and Felixstowe for example. Little consideration is required to endorse Mr. Glover's view that this comparison between the day and night business is going to be of great value to the gas industry. We have only to consider the directions whence this great day consumption has accrued, and how unassailable in the matter of efficiency are these applications of gas, to see the value of the statistics in enforcing the stability of the gas industry from the point of view of capital investment. While the day business is accumulating in this way, there is the night business to protect; and it must not be forgotten that the stronger the competition, and the more facilities that are offered by the competitors of gas, the more independent will some consumers become. That perfectly human quality has to be combated; and the competitor must be checkmated in his efforts to steal marches. What, it may be asked, are we drifting to in this regard?

Free inspection and maintenance, with a charge only for the material used, is with us; and there was full recognition in Thursday's discussion that this was the administrative mode that would in future have to be adopted by all gas undertakings for the proper protection of their lighting interests. We have efficiency and economy on one side; consumers' indolence and competition on the other. What has to be done is not to allow the two latter to injure the two former; and the only answer that has yet been found to the question "How best "is this to be done?" has been free inspection, cleaning, and adjusting. This work is going to cost money. Protection is worth paying for. But a steady eye and firm hand must be kept upon the facilities afforded, in order that there may not be wasteful and unprofitable expenditure. This brings us to another point of the discussion. If there is going to be a growth of the system of free inspection and, up to a point, maintenance, then more properly trained men will be required in this field; and every gas undertaking must take steps to provide their own men. That is the requirement. It is no use sending men out among the consumers who are only half qualified for the work they have to perform, and are otherwise unfitted to act as representatives between gas supplier and customer. Some complaint was made at the meeting that our local technical colleges do not provide opportunities for the training of gas-fitters. There are few local technical schools that have been encouraged to do so, and few that have been approached in the matter. If there is any blame attaching in this connection, let us be just, and see whether it should not be apportioned so that a substantial share remained with the gas undertakings. However that may be, better provision for thorough training has got to be made; and those responsible for the administration of gas undertakings who have not already moved in the matter will have to bestir themselves, in order that injury may not be self-inflicted by apathy over a fresh necessity born of changed condition.

Views from Hull.

THE broad and intuitive mind of Mr. John Young was before the members of the Eastern Counties' Association in every part of the address which he delivered to them last Thursday. Throughout, it was commercial-technical. In such a business as that of the gas industry, it is impossible to separate the one side from the other. In fact, the commerce of the industry largely governs its technic. Now, it is not what we can produce under a given set of technical conditions and practices, but what we must produce to meet the diverse requirements of the times. This is true to-day more than it would have been (say) thirty years ago. The staple product, for example, must be multipotent. It must be a product that will best suit the incandescent burner for lighting, the cooking and the heating stove, the manufacturers' furnaces and crucibles, and last, but not least, the work that is required of it in gas-engine cylinders. The secondary product, coke, must be of a kind that will meet, within practicable limits, both the industrial and domestic uses. So we go on, finding in every form of product how the commercial affairs of the industry must dominate technical procedure if the financial record is to be endorsed by the coveted term "success." In the consideration of some of the commercial-technical phases of our industry, we may traverse with Mr. Young from coal to certain of the uses of gas, and to commercial method.

The President is on safe ground in seeing no good in the Coal Mines (Eight Hours) Act. Never has there been a legislative measure that has belied more quickly the imaginative utterance and specious argument of its backers. It has come as a stormy petrel. It has caused much disturbance in the coal-field, and has cast many a shadow beyond. It has thrown the whole of the industries depending upon coal for their operation into a state of suspense, and has put them to considerable expense in providing for the threatened dislocation of supplies. From a fair state of certainty, the Act has precipitated industry into one of uncertainty, and has provided the coal industry itself with fresh and perpetual causes for disturbance. We cannot follow the President in his statements as to the date for the introduction of the Bill having been well chosen by the Miners' Unions, and as to their hoping to get the Act into operation on a falling market, so that they could point out—not "very justly"—that the price of coal under the new Act was less than the previous

year, and "no doubt claim that it had been beneficial to the "community at large." The Eight Hours' Bill now in force as an Act had an antecedent history; and a measure of the kind would have come into operation long before if the Coal Miners' Federation could but have had their way. No question of high prices and a falling market had any weight in the introduction of the present measure. It was merely politically opportune; and there were certain pledges to be fulfilled which, unfortunately, were more respected than the interests of industry and the community generally. The price of coal is lower than it was a couple of years ago; but the miners have, and honestly, made no claim that the Act has had anything to do with bringing about the more moderate terms. We all recognize that the price of coal would be lower still were it not for the Act. As a matter of fact, the basis of the miners' wages is the price of coal; and one of the effects of the Act is going to be a higher minimum level for the miners' wages, which will, in the natural order of things, keep the price of coal above the old normal under the prevailing conditions. Another effect is the reduction of the output. "We hear of reductions of 10 and 16 per cent. "per man," says the President. "This must mean a per-"manent enhancement of the price of coal; and the cost of "production of every article manufactured in this country "must therefore be increased." Beyond this is the additional cost of working the collieries that the operation of the Act must bring about. Whatever the means (though they be artificial), the enhancement of the price of coal will benefit the wages of the miners. We must not lose sight of facts, nor of the fairly discernible motives for the Act. In its origin, the Act is purely Socialistic. The Government have undertaken to carry through a programme of social reform. They are walking in unexplored ways; and in this instance, they have produced a monstrosity clothed in "social reform" garb. The "reform" has already proved injurious to the people and to industry. It is by the protection and assistance, and not by the assailing of industrial economy, that the country can maintain its position, that more opportunity for work can be given, and that the level of social status can be raised and maintained. The Eight Hours' Act has already proved itself a melancholy mistake.

Treating of the residual products of gas manufacture from the commercial point of view, the President on the whole is cheerful. He regards the outlook for coke as "hopeful;" and for sulphate of ammonia as "distinctly hopeful." But his high plane of optimism in these respects does not survive his survey of the tar market. Competition has arisen, and it is increasing, from other sources. In short, the increasing production must be looked upon with "grave fears," unless new markets can be created. But, other than for road use, there is not in sight any great activity in trying to evolve new uses for tar. From our way of thinking, there is little use in deploring the application of a material of such intrinsic richness to such a common purpose as road surfacing, if there is not a better use at hand, with the daily copious production of the commodity, not only from gas-works but from coke-oven plants. These plants, by the way, do not appeal to the President as being of any service to the gas manufacturer, having regard to the character of the gas, and the purposes to which town's gas is applied. Illuminating power in this country imposes a limitation to the actions of the gas manufacturer on his technical side; and this is a point in Mr. Young's review of the carbonization position, in relation to which he adopts a non-committal attitude, and shows no preference for any particular system, though he regards the steady passage of coal through the vertical retort (giving, as it does, greater uniformity of product throughout the period of carbonization) as being theoretically correct. This lifts the veil on a preference as between intermittent and continuous carbonization in vertical retorts; but it goes no farther. For it is clear that Mr. Young has a leaning of tenderness towards horizontal and inclined retorts under the newer method of working, which method indicates that the prevailing practices of the immediate past possessed the weakness and wastefulness, ofttimes revealed, of a too slavish following of tradition.

By kinship, there is a tie between the President and America; and he has some instructive data to put forward as to the experiences there of big charges and high temperatures. This is interesting not only on account of the results, but because America, through the early and the widespread adoption of carburetted water-gas plant, at one time fell behind in coal carbonization practice. In the more recent years, however, there has again been a forging ahead; and there are to be found in American works now some of the best examples of horizontal and inclined retort working. And we are not sure, having heard Mr. Young's remarks, that America has not preceded us in securing the advantages of heavier charges in horizontal and inclined retorts. However that may be, the cited results are excellent; but we have no information as to the character of the coal used. It must be a generous coal; and it is safe to say, having regard to the illuminating power of the gas, and the burner used in its testing, though the make is high the gas is good, and low in inert constituents. In connection with the heavy charging of horizontal retorts, there is a point in the address on which it would be interesting to have more details. The President states that "the scoop containing the charge acts as a "discharging ram, and is so constructed that it leaves an "almost full charge in the retort. The space left unfilled "is only about 3 inches from the top of the retort." This shows that there are ways and means of utilizing the scoop for almost filling a retort; and it contests the contention that the projector is the only practicable way of putting in a practically full charge. It can only be conjectured that the scoop is an unusually broad and shallow one, to pass over an empty space of merely 3 inches at the top without disturbing the lie of the charge; and that, as the head of the scoop must necessarily be a large one to negotiate a big charge, it must be a hinged one, upturning on the return stroke (after the manner of the Fiddes-Aldridge machine), to pass over the top of the charge. Perhaps Mr. Young can say something more about the construction of this scoop.

There are words of wisdom for the budding gas engineer in the address, as to training and the value of system in work, both technical and commercial. The chief executive official of a gas undertaking must be not only an engineer, but a good manager both technically and commercially; and, in this connection, the words of the President are pregnant with meaning when he says that "in the training "of the young gas engineer, his commercial instincts are "usually left to develop by chance." This ought not to be. The fortunes of an undertaking lie in large measure in the ability shown in buying and selling, and in the spirit, intelligence, and diplomacy infused into the competitive work of the day. The spirit need not be obtrusively militant; but it must be of a kind that is both seen and felt. Such spirit is found at Hull; and one effect is modestly referred to by the President. In the commercial department of the Hull station of the British Gaslight Company, a special feature has been made of the lighting of tradesmen's premises, both internal and external, with the result that there are "in use "on the maintenance plan 1254 lamps, representing 5016 "burners, nearly the whole of which have *superseded* elec-"tricity." Well done! Another line of the gas business which is the subject of much technical and commercial consideration at the present time is that of gas heating; and upon this the President passed some instructive comment. But in this regard our impression is not that of Mr. Young, that the Gas Heating Research Committee of the Institution have accepted the theory that rooms can be heated by radiated heat alone. We think there has been a little misconception on his part in reference to this point. However, from beginning to end, the address is a thoughtful one; and there was profit in its hearing, as there will be in its reading.

Purification by Liquids.

The greatest novelty in the whole proceedings at the meeting of the Eastern Counties Association at Hull last week was the Feld plant that has been erected at the East Hull Gas Company's works for the purification of the gas from sulphuretted hydrogen by washing in liquor in Feld's centrifugal washers. In fact, it is not too much to say that it is the greatest novelty at the moment in the whole range of plant employed in British gas-works; but it has yet to prove its title, under British gas-manufacturing conditions, to superiority over the present system of effecting the same purpose. That superiority has to be proved from the twin points of efficiency and economy. Oxide purification has an established reputation for efficiency as an eliminator of sulphuretted hydrogen from gas; the nuisance associated with it is not great; the purifiers require opening less frequently than was formerly the case; but at the best the process and all it entails can only be regarded as a cumbrous method of achieving the ends of purification and the recovery of the sulphur. A large space is required for the purifying-boxes; the material has in most cases to be transported from a distance to the gas

works; the system involves, over all, considerable labour in handling the material, and in the work of revivification; and again there is the transporting of the spent oxide to the place of sulphur recovery, and then the expense of the recovery. But, after all, deducting the cost of the new material from the revenue obtained for the sulphur-laden oxide, the net purification costs per 1000 cubic feet are exceedingly modest. However, there has for the past quarter of a century been fascination in the idea of conducting the purification of gas in closed vessels by means of liquids; but from the Belfast experiences to the present time, the theoretically ideal has not eventuated in the perfection of operation and result that appeals to the practical mind. Has Herr Feld succeeded where others have failed? Has he succeeded in producing a plant, self-contained, in which a cyclical action proceeds without waste and with economy, without the escape of anything but innocuous gases, in which plant the unpurified gas enters, the sulphuretted hydrogen is totally eliminated, and the sulphur is removed as a solid precipitate? If so, then Herr Feld will deserve the highest esteem of the gas industry. For such a system will mean further economy and greater facility, and give to the industry the direct marketing of a readily selling product.

From the works of the East Hull Gas Company is to come the proof, or otherwise, of success; and upon Mr. John Holliday, the Engineer of those works, rests the responsibility of telling us whether or not the system really inaugurates an acceptable change in our methods of purification. The fact that the plant has been erected at the East Hull works (though the final details of construction were not sufficiently complete for the plant to be in operation on Friday) shows that confidence has been established in Mr. Holliday's mind that, under—and this we emphasize—the conditions in which he investigated the system at Königsberg on a plant of smaller capacity (this one at East Hull is equal to dealing with about 1½ million cubic feet of gas per day), the claims are confirmed. But what he has to prove now is whether or not the same successful operation will be repeated using English coals; and whether the plant will suffer any undue depreciation by reason of the chemical operations conducted in and by it. Radically, the present system for the purifying of gas from sulphuretted hydrogen and the one now claiming notice are so dissimilar, that there is nothing to be gained by any comparison of the individual items of finance—such as capital expenditure, cost of maintenance, expense of operation, and so forth; nothing but a final balance-sheet will enable judgment to be passed on the relative financial aspects. But again, in that regard, the presence of the plant at East Hull marks the confidence of the technical adviser of the Company. This, however, should be made quite plain—that he does not at the present time commit himself to any definite statement either on the point of efficient working or ultimate financial economy; and only confirmation under these heads will entitle the plant to continuance at the works. This, we think, makes Mr. Holliday's position perfectly clear.

As has been said, the system is a self-contained one from beginning to end. This was seen from the description published last week; and, through a communication from Herr Feld published in this issue, it is learned that an extension of the functions of the plant has just been made by which ammonia and sulphuretted hydrogen can, it is claimed, be extracted simultaneously—the ammonia being obtained in the form of a strong solution of sulphate of ammonia, without further distillation, and without using sulphuric acid for its formation, the sulphur extracted from the gas being used for the purpose. But this functional extension has no part in the plant as erected at East Hull; and therefore to the simple system of sulphuretted hydrogen purification and recovery of sulphur there, this notice may be confined. In it, thiosulphate of zinc is the active reagent used, which is produced as part of the system in the plant itself. This zinc thiosulphate is the washing liquor for the gas, and is used in two of the Feld centrifugal washers, passing successively from No. 1 to No. 2. The washing liquor reacts with the sulphuretted hydrogen contained in the gas, forming zinc sulphide and free sulphur as precipitates. The liquor itself undergoes regeneration by converting the zinc sulphide into zinc thiosulphate by the action upon it of sulphur dioxide. And so the cycle of operations continues without waste. When the liquor contains about 15 per cent. of sulphur, it is again treated with sulphur dioxide until the whole of the zinc sulphide is formed into zinc thiosulphate, while the sulphur is recovered in solid form, uncontaminated with zinc sulphide—the liquor being once more reused for washing the gas. That, in brief, is the chain of operations and reactions; and it must be admitted that simplicity is one of the strong features of the process as a whole.

There for the present we leave this new system. It is early to speculate or to form assumptions. The process is in safe hands with Mr. Holliday; and it will soon commence making its history and adding to our knowledge. As we have said, oxide purification is cheap and efficient, but cumbersome. Efficiency and financial result are the issues between the established process and the new one.

Angered Shareholders.

The deluded holders of shares in the Eaton group of promotions are indignant over the position in which they find themselves. They have learned by experience that confidence must not be placed in every prospectus that holds out lustrous promise, though founded on an industry that has a history of solidity and great success at its back. The shareholders of the Ticehurst Company met last Tuesday, at the bidding of one of their number (Mr. C. S. Glover), to discuss the position to which they have been gradually lowered by the scheming of Eaton and his confederates; and if the attitude of the speakers at the meeting may be taken as an earnest of the determination of their future procedure, it is clear that no stone will be left unturned to ascertain distinctly whether or not Eaton and his associates have brought themselves within the reach of the arm of the law, and the extent of the assets that represent the heavy capital expenditure that has gone through one or other of the channels so cleverly provided for the purpose by the promoters. It is feared that the assets of the Ticehurst Company will prove microscopic in contrast with the money that has been wafted no shareholder knows exactly whither, but all can give a shrewd guess. From the discussion at the meeting, it is clear that these No. 99, Cannon Street promoters have offended in almost every conceivable way against the proprieties of Company promotion and administration. The shareholders' interests have been sacrificed and made subservient to the parasitical designs of these promoters; but the tale is only common, in more or less degree, to this group of flotations. Some of the shareholders who spoke at the meeting have dropped money into more than one of the concerns; and they bear the same testimony as to, in cases, debenture interest not being forthcoming without pressure, of no profits being made from the sickly concerns with enormous capitals for the business done, of wasteful capital expenditure through the notorious Works Construction Company, of indifference to shareholders' appeals, and of every possible excuse being made in temporizing with importunate shareholders. One of the most pitiful features of the tale is the number of women and poor working men who have been beguiled by specious prospectus, and the inducement of a remarkable dividend, to "invest" their hard-earned savings. Who is to protect such folk from the arts and wiles of these promoters? The Chairman at the Ticehurst meeting declared that he had been advised that the prospectuses of this Company were legally misleading. Whether or not the astute ones at No. 99, Cannon Street have managed to keep just within the bounds of the law is not for us to say; but there is no doubt whatever about it that prospectuses issued by them have been misleading to a large number of people, and results have negatived the subtle promises held out at the time of flotation. If deception such as this can have a humorous side, it has been (to those with technical knowledge) the use that has been made of the most common titles to names in the prospectuses to allure the public. One of the shareholders pointed out that Eaton, the promoter, although not a member of the Institution of Civil Engineers, affixed "C. E." to his name. It is true that his latter years have been spent in engineering things to his personal advantage; and possibly he thinks that he has as much right to the self-application of a useless and meaningless title as other men who indulge in the foolishness without any attestation to qualification that gives the right.

Some Reflections on a Visit to Leeds University.

Our electrical friends must be getting a bit tired of hearing about the scientific aid that the gas industry has provided through the Leeds University; but they can console themselves that they are not badly looked after at the National Physical Laboratory—and not through any special financial provision by the electrical industry. The "Engineering

"Correspondent" of the "Daily Telegraph" lately went to the Leeds University; and has been pleasurably struck with what Dr. W. A. Bone had to show him as to what is being done there for carrying on work for the gas industry in connection with the endowment of the chair of Gas Engineering and Fuel, as a memorial to the late Sir George Livesey. The visitor viewed the arrangements for investigations on gaseous explosions under high pressures, which, it is hoped, will throw much light on the chemical aspect of gas-engine problems. The photometrical appliances fitted up by Dr. Bone, which installation has been designed so that it can easily be adapted to new arrangements, attracted the visitor; and the possibilities of persistent work by its assistance opened up to him a bright vista. We recognize with gratitude in the gas industry that the two most powerful aids that we have in the lighting field are the products of the laboratory—the bunsen burner and the mantle; and there is not the slightest doubt that the co-operation that has been assured between the practical workers of the gas industry and the highly skilled chemists and physicists at the Leeds University, will redound to the credit and the benefit of both the University and the gas industry.

What he saw and what he heard at the Leeds University led the "Engineering Correspondent" of our morning contemporary to reflect on the advantage to gas and electricity consumers of such ceaseless scientific activity, fostered by the competition between the two rival divisions of lighting. He finds that the advocates of each illuminating agent are restless in their endeavours to convince the householder of the great advantage to be gained by using some new improvement. But in his article, while he says much in praise of the new electric metallic filament lamp, he overlooks the claim to specific notice of the newest forms of inverted gas-lamps now in competition with the electric metallic filament lamp. It may be quite true there are now over 4 million metallic filament lamps in use in this country; but it is not a startling number. To make a computation of the myriads of incandescent gas-lamps in use in this country would be a matter of supreme difficulty. Then the writer proceeds to say that the houses of the very poor may now be fitted with electric lamps. There is a stretching of the imagination here. In looking for an explanation of his meaning, it is found that the writer calculates that with electricity, using a metallic filament lamp, at 3d. per unit twenty hours of light can be obtained by the payment of 1d. for the current consumed. But what a light? Spreading the pennyworth of electricity over twenty hours, the allowance per hour comes out to only 16 watts, or about sufficient for a 12-candle power lamp. With a pennyworth of gas at 2s. 6d. per 1000 cubic feet, using the bijou inverted burner, a light of from 20 to 25 candles can be obtained for thirty hours. It is because of this cheapness, and because consumers can use these "new improvements without having to pay for expen-"sive fittings," that electricity, notwithstanding the assistance of the metallic filament lamp, finds it so difficult to make conspicuous headway in the domain of private lighting. The engineering contributor of our contemporary also remarks that the scientific reputation of the gas engineer is at stake. We do not know what he had in mind in making this remark; but there is truth in his previous assertion that gas engineers are not going to rest on their laurels. In the cause of progress, not only in the cooking, heating, and motive power branches of their business, gas engineers are as keen and alert as ever; and we may go farther and claim that their keenness and alertness are intensified by the successes in producing higher efficiencies and economies, as much as by the sharper competition they have to meet.

Welsbach Company and Electric Metallic Filaments.

The electricity supply industry has spasmodic attacks of jubilation; and one of them is on at the moment. The cause is that the Welsbach Company—a business concern with large resources and powers of distribution—have extended their business into the supply of electric metallic filament lamps. This is regarded by the more sanguine electrical spirits as highly significant, and as auguring the approach of the final collapse of the lighting business of the gas industry, notwithstanding that to-day there are a greater number of mantles sold than ever, that the authorities on mantle sales estimate the output in the United Kingdom at no less than 50 millions a year, and that never has there been a time when the implements of incandescent gas lighting have shown such efficiency as they do to-day. We fail to see why there should be any excitement whatever over the Company's fresh move. They are only doing now what many makers of gas lighting fittings did years ago—that was, took the opportunity offered by electric lighting of enlarging the area of their businesses, and yet the gas-lighting business of such firms has remained the chief source of their revenue, and has continued to increase abundantly side by side with the smaller and less progressive and lucrative electrical branch. Most municipal owners of gas-works are also owners of electricity works. There are also gas companies who have taken powers to supply electricity. And all on account of much the same influence that has operated in inducing the Welsbach Company to extend their enterprise into the supply of the electric metallic filament lamp—that is, to be in the position to supply a demand, leaving the consumer to exercise his own preference as between gas and electricity. Having entered into this new business, the future policy of the Welsbach Company is that of purely independent commerce in lighting, as is evidenced by the following paragraph that appears in a circular issued by them on their new venture:

> As a business move, there can be no question of the soundness of the Welsbach policy, because, whilst there is not, and cannot be, any suggestion that electricity is as yet anything like so cheap as incandescent gas, still the Welsbach is a business company, and there are factors other than cheapness to be taken into consideration, notably the greater cleanliness of electric light.

Not a New Idea, and Changed Conditions.

Sentiment cannot enter very largely into business; but from the purely sentimental point of view, the Welsbach Company see a fitness about the expansion of their trading into that of electric metallic filaments, inasmuch as Baron Welsbach was the inventor of the incandescent gas-mantle, and likewise of the first metallic filament lamp—the Osmium. For that reason alone there is no room for surprise at the Company taking up the marketing of both forms of lamp. The idea of doing so is not by any means a new one with them. In 1901 the question was before the Board; and as recently as the meeting of the shareholders last May, the Chairman (the Right. Hon. Lord Weardale) stated that: "Numerous propositions had been made to the Company to take up the manufacture of electric metallic filament lamps. Although the Board recognized it was their duty to examine these suggestions, nothing had so far been put before them to justify them making such a radical departure." A proposition that would commend itself was apparently nearer than Lord Weardale imagined at the time. The change does not by any means point to the Company doing any less business than before in gas mantles; for immediately preceding the quoted declaration, his Lordship had stated that they had sold during the year more mantles than ever before, but competition and the craze for the lower priced mantles had had effect. The Company are now working in the open market; and the present Board are suffering from the administrative and financial extravagances and indiscretions of their predecessors in office of years ago. Between the cheaper mantle trade and the heavy capital, the difficulties of the Board are sandwiched; and hence the desire to broaden the basis of business as much as possible. The Company's present action will only be a seven days' wonder; and their big interests in the gas industry and in the Austrian Fluid Company must ever give to the gas mantle prior place in their considerations and operations. It is curious that the electricity supply industry should be so jubilant at receiving assistance from a Company whose roots are irremovably planted in the gas industry. The section of the electrical industry that will not receive the Welsbach Company with open arms is the one engaged in the manufacture and sale of electric metallic filament lamps. The prices of these lamps have been knocked about already pretty severely; and therefore the low price of the Welsbach variety will not be very acceptable to the makers of those previously in the field. It will be interesting to watch the course of events in this connection with the new business being conducted through the far-reaching distribution channels that the Company command in association with the incandescent gas mantle business.

An Elective Auditor on Manchester Affairs.

As an Elective Auditor, Mr. S. Norbury Williams, who represents the Manchester citizens in this connection, must surely hold a record. The election shortly to be made will be his

seventeenth; and on no less than ten occasions he has fought for his position. Perhaps, however, "fight" is hardly the correct term to use, inasmuch as no candidate is permitted to spend a single farthing on making his candidature known, so that the contests cannot possibly be of a very strenuous or exciting character. But in spite of this prohibition of the tactics which one is accustomed to associate with elections, there is a method open of making both the election and the views of a particular candidate widely known; and of this means Mr. Norbury Williams is not slow to avail himself. In the course of a three-column article in the "Manchester City News" last Saturday, under the heading of "Spending and Wasting," he expresses his opinions on the labours of the Council with a candour that is quite invigorating. True, much that is said has been said before—and by the same gentleman; but this repetition will be admitted as inevitable, when one considers the number of years the author of the article has interested himself in the work of Elective Auditing. Naturally, the "steady, persistent, and almost dreadful" rise in the rates is enlarged upon to considerable extent; but other points also receive attention. Mr. Norbury Williams draws attention to an article written by him as long ago as 1886, in which an opinion was expressed with which many people at the present day will be inclined to agree. He says: "I tried to induce my fellow-citizens to banish Imperial politics from municipal elections, and warned them of the inevitable rise in the rates if they persisted in sending men to the Council because of their political colour, and not on account of their municipal suitableness and ability. But the old game is still being played. The lists of candidates for the forthcoming elections, which appear in the papers, are still marked with the orthodox letters, 'L' and 'C.'" What he would like to see in the Council is a body of men of all parties who should band themselves together for the specific purpose of carrying certain urgently pressing reforms, and who would give themselves no rest until these were accomplished. Among the list should be uniform rating throughout the city and uniform representation of the citizens, to be secured by an equitable remodelling of the wards. On general principles such as these, the Elective Auditor is on comparatively safe ground; but we are not sure that he is always quite so successful when dealing with specific matters relating to individual trading departments. The salaries paid to the gas collectors seem to form a subject which could well be left to the Committee who are entrusted with the administration of the undertaking; while as for his lengthy remarks on the illuminating power of the gas, they cannot be said to assist in elucidating the "mystery" which appears to him to exist about the question.

The Secretaryship of the Société Technique.—We learn that M. Payet, the Secretary of the Société Technique du Gaz en France, has been appointed Technical Director of the Company recently formed for promoting the sale in France of the motors constructed by the "National" Gas-Engine Company, of Ashton-under-Lyne. Under these circumstances, he will relinquish his present position, which he has occupied for about seven years. In wishing him success in his new sphere, we take the opportunity of again expressing our appreciation of the courtesy he has always shown to the representative of the "Journal" who has attended the annual meetings of the Society.

Manchester and District Junior Gas Association.—We learn from the Hon. Secretary (Mr. J. Alsop) that the first meeting of the Association for the ensuing session will take place next Saturday, when the members will accept the invitation of the President (Mr. J. Taylor, of Mossley) to visit his works, where they will be received by the Chairman and members of the Works Sub-Committee. At the close of the inspection, they will leave for the water-works light railway, where, by the kindness of Messrs. Morrison and Masons (through Mr. A. Lang, the Resident Engineer), carriages will be in readiness to convey them to the site of the Chew reservoir, now under construction. On arriving, it is expected the Engineer to the Ashton-under-Lyne, Stalybridge, and Dukinfield Joint Water Committee (Mr. F. J. Dixon) will meet the party, and fully describe the works. The first "Coffee Meeting" of the Association will be held on the 12th prox., in the City Café, Deansgate, Manchester, when the evening will be devoted to the study of several of the latest and most improved instruments used in chemical laboratories, outside departments, &c. Some important instruments, not as yet to be found in any gas-works in this country, will be on view. The programme for the session shows that arrangements have been made for some interesting visits, one being to the Manchester University, when Professor Harold B. Dixon, F.R.S., will deliver a lecture on "The Chemistry of Flame."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 850.)

Movements on the Stock Exchange last week were irregular, in response to the varying influences of the moment. The stronger factors, however, were calculated to depress rather than to cheer—such as the steady hardening of gold, disquietude in regard to politics, and unsatisfactory railway statistics. On the opening day, business was a shade quicker and brighter, but mostly in the more speculative lines. Consols were $\frac{1}{8}$ worse. Railways rose on the postponement of the Welsh coal struggle (one of the parties declining to fight); and the American Market was buoyant—indeed, flamboyant. On Tuesday, the general tone was tolerably good; but Rails were rather shaky. Wednesday was weaker, and prices showed a shrinkage in many lines. Consols dropped $\frac{3}{16}$; Railways were flat; and Americans see-sawed up and down. On Thursday, markets were sleepy for the most part, and prices drooped from sheer inanition. Consols fell $\frac{1}{8}$. On Friday, general languor was the characteristic in most lines—tired of the long account, as some said—with still more weakness in the gilt-edged division, and a further fall in Consols. Saturday was the great Jewish fast-day, and everything was very quiet. Consols were repeatedly marked below 83. In the Money Market, the abundant supply to meet demands for the short loans was undiminished; but the run on gold, and the raising of the Berlin bank rate, tended to harden discount materially. The latest quotations, however, ruled easier. In the Gas Market, business showed a falling-off in point of volume. The general tendency was quite steady, and hardly any changes in quotations were made. In Gaslight and Coke issues, moderate business was done in the ordinary at very steady prices, ranging only between $105\frac{3}{4}$ and $106\frac{1}{4}$. The secured issues exhibited their usual quietude; the maximum being done at from $88\frac{1}{2}$ to 89, the preference at from 104 to 105, and the debenture at 86 to $86\frac{3}{4}$. The quotation of the latter was adjusted into line with that of the similar issue of South Metropolitan. The ordinary stock of the last-mentioned Company was firm and unchanged, transactions showing a range from $119\frac{1}{2}$ to $120\frac{3}{4}$. The debenture was done at 85. In Commercials, the only issue dealt in was the 4 per cent., which changed hands at 109 and $109\frac{1}{2}$. The Suburban and Provincial group were, perhaps, quieter than ever; the only transactions marked being a couple of bargains in West Ham at $124\frac{1}{2}$. But the quotations of Bromley "A," Sheffield "A," and Wandsworth "B" rose a point each; and of Alliance and Dublin old half-a-point. The Continental companies were again very quiet. Imperial, which had been rather shaky lately, gave way a point, with transactions from 180 to $178\frac{1}{2}$; Union was done once at $95\frac{3}{4}$; and European fully-paid marked $24\frac{5}{8}$ and $24\frac{7}{8}$. Among the undertakings of the remoter world, Buenos Ayres changed hands at $13\frac{3}{4}$, Cape Town debenture at $48\frac{1}{2}$, Melbourne 5 per cent. at 103, Monte Video at 13 and $13\frac{1}{8}$, Primitiva at from $7\frac{3}{16}$ to $7\frac{5}{16}$, ditto preference at $5\frac{1}{4}$, and River Plate at $16\frac{7}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

Heating and Cooking—The Cooker Par Excellence—Further Views on the "Therol" Water-Heater, and its Claims—A Trip to Berlin—A Virtuous Protest.

This is the season of the year when perhaps more than at any other attention seriously turns to questions of heating and eating. Gas-fires are being overhauled; and coal cellars filled. Electrical radiators are being disconnected, and gas-fires fitted in their place, with exceeding advantage from the pocket and comfort points of view. The improvements that are being effected in gas-fires by the manufacturers are receiving notice in our columns; but we do not find any startling innovations in the electrical heating line. The electric radiators seem to have fallen into hard-and-fast grooves, in regard to design, consumption, and low efficiency; and nothing short of a miracle can alter the two latter conditions. A week ago we were noticing the last achievement in respect of the electrical heating of water; and a further reference will be made in a succeeding paragraph. But, as we say, the season is one when thoughts turn, more than at any other period of the year, to entertainment at the well-laden board; and so it is not inappropriate to glance at one of the latest electric cooking productions. This is the "Tricity" cooker. In the past there have been remarks in the "Memoranda" as to the lack of mechanical strength in electric cooking apparatus, as to the consumption of current being too large, as to slow action, and as to low temperature, which allegations have been categorically and successively (not successfully) denied. Of course, we cannot expect from our electrical friends "any negation of the faith" (as Lord Rosebery would say) that is within them. The manufacturers of the "Tricity" cooker, however, now declare that the troubles enumerated have hitherto really attached to electric cooking apparatus; and the "Electrical Times" declares that the said manufacturers on these points "truly remark." We are satisfied. But, of course, the "Tricity" cooker has eliminated all troubles.

From our contemporary's description, it is gathered that special pots and pans are not required with the new-comer, so long as

their bottoms are as flat as possible. That can easily be arranged. The trailing flexibles which are "so fruitful a source of minor accidents, are dispensed with;" and one flexible between plug and cooker is all that is required. The heater is also stated to be an interesting adaptation of the transformer, and is intended solely for use on alternating current systems. That is a limitation. The consumption of the cooker is about 900 watts at full, and 150 watts at the lowest, heat; there being six degrees of heat obtained by the manipulation of two switches. It is observed that there are none of the old comparisons with gas published in this notice of the new cooker. So often have electrical friends been tripped up through manufacturers' figures, that perhaps they have now concluded there is wisdom in restraint. It is considered obvious, however, that the life of a "Tricity" cooker must approximate to that of a transformer operating under favourable conditions, "which is a very considerable period of time—far beyond that of a much used gas ring." This is all too funny; but laughter is stayed by the serious search that is being mentally made for any part of a gas-ring that is likely to wear out. With a gas-ring there is no need to protect the user from shocks; while in the case of this paragon of an electric cooker, there has been devoted to its construction as much consideration as is given to the building of a "Dreadnought." We read that particular care has been paid to the making of the apparatus safe from shocks; all live parts being completely protected by the iron case. The flexible also is stoutly armoured, and is well able to stand ordinary usage. The statements may be accepted for the nonce. Curiously the article succeeding the description of the "Tricity" cooker is headed "Treatment for Electric Shock." In the opening lines, we learn that our contemporary has prepared for the use of electric power suppliers a wall card giving instructions as to treatment in the event of a person receiving an electric shock. It is not supposed that this is intended for use in the ordinary household, though we have heard, through a certain chief inspector, of deaths from electricity at 200 volts and thereabouts. But perhaps it would not be inappropriate to prepare a mural card, giving a few suitable expressions for use in the domestic circle in the event of shock resulting in death when using electrical apparatus.

A study of the "Therol" electric water heater, and of the extraordinary claims held out for it, did not permit the discovery on our part of anything to cause acknowledgment, in our references last week, of participation in the sanguine hopes of some of our easily elated electrical contemporaries as to the convenience it would afford in the household equipment, nor as to it doing much towards rendering assistance in attaining the deeply rooted desire of central station engineers in the matter of a 100 per cent. load factor. A central station engineer has not to ponder long over the performances and needs of this water-heater to make him conscious, although he may not give publicity to his views, that it has in its infantile stage been much over-rated. A letter by Mr. A. H. Dykes (the Electrical Engineer who was responsible for carrying out the installation of the electricity works of the Ascot Gas and Electricity Company), published in one of our electrical contemporaries, suggests to us that he is not so enamoured of the new appliance as some of the writers who preceded him with accounts of their judgments. The "only criticism," he says, that one might venture to make, is that where water is hard trouble might arise through scale depositing in the coil pipe in which the water is heated, more particularly as the temperature at times rises to a fairly high limit. Though that is the "only" criticism Mr. Dykes started out to make, he indulges in a little contradiction of his own words by "venturing" to make others. As was pointed out last week, the 25-gallon size heater takes 200 watts an hour, which would amount to 1772 units per annum, running continuously throughout the year. Having regard to this figure, Mr. Dykes fears it would not prove very profitable to a company to hire out the apparatus and supply current for an annual payment of approximately £4 10s., except in cases where it could be arranged that the heater could be switched off during peak load. He makes his case as follows on this point:

> It must not be forgotten that, when quoting a low rate for power purposes, such as £4 10s. per kilowatt of demand, and 0·3d. per unit, the kilowatt charge is based on the fact that the diversity factor of the power load is very much greater than for a lighting load; the charge for a purely lighting load being probably £12 per kilowatt, and 0·5d. per unit. If these heaters are to run 24 hours during the day, their diversity factor is unity; and the cost therefore would probably work out, at 0·2 kilowatt, as follows: £12 = £2 8s., *plus* 1772 units at 0·3d. per unit equals £2 4s. 3d., making a total of £4 12s. 3d., to which would have to be added the cost of upkeep of the apparatus, and interest and sinking fund payments on the outlay, which, allowing for the cost of installing and wiring, would certainly not be less than £16 to £18.

An electrical undertaking cannot, of course, be constantly run on the philanthropic lines seen in some of the charges for power purposes and heating. The end of such a method of conducting any business can only be insolvency. The electricity consumer has always been the victim of the pretty projects for complication of the electrical engineer, in the effort to make things better for the central station. These complications confuse the consumer; and in some respects lessen his convenience, by making it subservient to cast-iron rule. In getting this 100 per cent. load factor through the "Therol" water-heater, it will be remembered that it was suggested that the current could be cut off from the heater and used for other purposes, such as lighting—the supply of hot water meantime being limited to the quantity of heat stored in the "Therol;" and the lighting capacity to five 32-candle power metallic filament lamps! Bearing on this point, Mr. Dykes remarks that "it looks as though it should be a very simple matter to arrange the limit-indicator in the lighting circuit, so that, whenever the current required for lighting was less than a certain amount, the current was switched on to the heater, and that when the current exceeded a given amount, the heater was cut off, so that the agreed maximum demand was not exceeded." Very good. The more complication and restriction, the greater the dissatisfaction of the consumer. So we—with our low flat-rates for gas, and an unrestricted use at any time for all purposes in a household—have nothing to complain about.

There are none so blind as those who will not try to see. A London electric firm, through G. A. Hughes, have recently addressed a letter to the electrical papers, ostensibly with a view to putting a little heart into their readers over the report and recommendations of the City Corporation deputation to the Continent to inquire into the matter of street lighting. The "firm" have, or Mr. Hughes has, been to Berlin. What they or he were or was doing in Berlin is not explained; but it is deplorable to find that they or he only found that the "less important streets were lighted by gas." But the electrical readers of this remarkable pronouncement have not gone into ecstasies over what the "firm" or Mr. Hughes found, as the authentic information contained in the report of the City deputation is not so ancient that interested electricians have not in memory two or three of the salient statistics obtained from official sources. The figures are sufficiently interesting to refer to again. The total number of electric arc lamps (open and flame) in Berlin is 864, of which 664 are fixed upon standards, and 200 are suspended in central positions in the streets. In addition, 212 electric glow lamps are in use. To set against these figures, we read that "high-pressure gas lighting is very largely and effectively used in Berlin—25 miles of streets being lit by 1531 lamps fitted with upright and inverted burners, two and three burners in each lantern;" and that "incandescent gas lighting (low-pressure) is used for the side streets, there being about 466 miles of streets lighted by 3000 upright burners and 2000 inverted burner lamps." Now what were the "firm" or Mr. Hughes about that they should only have been able to see that "the less important streets were lighted by gas?" But we go on to read in the letter: "Judging from the effect, we can only imagine that the Berlin City Fathers, being progressive (as is shown by the beauty of their charming city), are not likely to take the retrograde step of putting in more gas lighting than they can possibly help." Let us see from the report what the acknowledged progressive Berlin City Fathers are doing: "The Berlin authorities," it is stated, "have decided to spend 7 million marks (£350,000) in installing the latest patterns of high-pressure gas-lamps, with inverted burners, in lieu of the existing gas *and electric* lamps. Expenditure in this direction has been going on for the last two years at the rate of a million marks (£50,000) a year, and will be continued at the same rate for the next five years." After this there is no necessity to say more about this letter, excepting to point out that there is a little advertisement tacked on to the end, which confirms the statement we made at the time the report was issued, that there is no insuperable difficulty in the central suspension of gas-lamps. The letter says: "Our lowering gear is equally applicable to gas as to electric light, by the substitution of a gas connection for the usual electrical coupling; and there is no difficulty to us in dealing with this problem either for swan-neck poles, centrally hung carriers, or cross-street suspension gear." Perhaps our electrical friends, upon this testimony from an electrical source, will now cease their thankfulness over the erroneous assumption that gas will be "done" by the condition that is attached to the recommendation of the City deputation, as to centrally hung lamps being manipulated by lowering gear.

There is sympathy with our friends of the "Electrician." They refuse to be parties to any fraud being perpetrated on the public in the matter of the candle power of metallic filament lamps. They are righteously indignant over the retrograde step that appears to be taking place in this regard; and it is feared by them that the term "candle power" as applied to these lamps will become merely a nominal expression. It has been a misnomer in most instances from the importation of the metallic filament lamp from Germany. First there was an attempt made to palm off the Hefner unit as a British standard candle; and (may we venture to say it?) certain electrical writers did not then know "which from t'other, and t'other from which." Now it is alleged that some of the English manufacturers of these lamps are copying foreign lamps "even as regards their rating in Hefner candle power." Hefner "unit" power, please! There is no such thing as a Hefner candle. But (this is bad) our contemporary understands that metallic filament lamps of English manufacture do not, in some cases, reach, even on the Hefner basis, their stated "candle power." "Thus, 100-volt lamps of so-called 16-candle power, frequently give, on being tested, only from 13 to 14 English, or International, candles, although they should give about 14·4 if rated originally on the Hefner basis." That use of the word "International" is a bit pedantic; and it is rather early to employ it in such a connection. Let us wait and see whether the term is justified by international adoption. The fear of our contemporary is that the delinquency to which attention is called may do harm by fostering the impression that electric lamps do not give sufficient light compared with the incandescent gas-lamps now so largely used.

PRESENTATION TO MR. W. DOIG GIBB.

At the Meeting of the Board of the Newcastle-upon-Tyne and Gateshead Gas Company last Tuesday, a presentation was made to the Engineer, Mr. W. Doig Gibb, on his leaving the Company's service to take the position of Chief Engineer to the South Metropolitan Gas Company.

In making the presentation, Sir William H. Stephenson, the Chairman, said the meeting would probably be the last which Mr. Gibb would attend as Engineer of the Company; and before he finally took his leave he (Sir William) and his colleagues on the Board wished to give, in some tangible form, an expression of the appreciation of Mr. Gibb's services during the seventeen years he had been connected with the Company. The silver salver which he was about to have the pleasure of presenting to Mr. Gibb was not of great intrinsic value. It was not, however, a matter of the intrinsic value of the gift, but the expression of the feelings which lay behind the giving. It was in their case an expression of good-will and appreciation of all the work which had devolved upon Mr. Gibb during the period of his connection with the Company, and which they thought would act as an incentive in the enlarged sphere of activity to which Mr. Gibb was going, where they hoped he would have greater scope for the abilities which he eminently possessed, and have much success and long years of happiness with his new employers. When Mr. Gibb came to the Company seventeen years ago, he occupied a small position with them, and had a reputation to make. Now he (Sir William) was sure Mr. Gibb had a reputation to lose; and the Directors had little doubt that he would not only sustain but increase it. The fact that he had reached the summit of his profession, and been President of the Institution of Gas Engineers, showed how his capabilities had been appreciated. In Mr. Gibb's quiet moments at home, the salver placed upon his sideboard would always remind him of his work with the Newcastle and Gateshead Gas Company and those connected with the Company whom he had left behind, and whose good wishes and kindly feelings towards him would, they trusted, help him to sustain the good name he had already acquired.

Sir William then handed to Mr. Gibb the salver to which he had referred, to keep and to pass on to his children and his children's children as an heirloom, to show the appreciation of the Directors of the Newcastle and Gateshead Gas Company of his services with the Company. He expressed the hope that Mr. Gibb would long be spared to occupy the highly important position which he was about to take, the appointment to which was the greatest compliment that could be paid to the record of his work in Newcastle.

The salver was of solid silver, and bore the inscription:

> Presented by Sir W. H. Stephenson, D.L., D.C.L., Chairman, and the Directors of the Newcastle-upon-Tyne and Gateshead Gas Company, to W. D. Gibb, Esquire, M.Inst.C.E., on his leaving their employment, after seventeen years' service, to take up the position of Chief Engineer to the South Metropolitan Gas Company.—21st September, 1909.

Mr. Gibb, in responding, said that when he went to Newcastle seventeen years ago it was, as Sir William Stephenson had stated, to take a small position and with a reputation to make. At that time he realized the difficulties of doing this; but, by the encouragement given him by his Directors, he had always endeavoured to do his best. He had already, in a letter to them, thanked them for the many kindnesses shown him during the time he had been with the Company, and for the opportunities they had afforded him, which had been the means to a large extent, of making his present position possible. He again expressed his appreciation of these kindnesses. He hoped that he would prove equal to the position he was about to take. He trusted that the confidence which the Directors of the Newcastle Gas Company had reposed in him would not be misplaced, and that the same confidence which he had merited in Newcastle would be placed in him by his new employers. He concluded by thanking the Directors for their very kindly gift, which he assured them would be regarded as an heirloom in his family, more especially as he understood it to be a personal gift from the Directors themselves

PERSONAL.

The marriage is announced—as having taken place on the 9th inst., at Epsom—of Mr. Ernest Frith, of Runcorn, to Miss Ethel Cogman, only daughter of Mr. Walter H. Cogman, of H.M. Customs and Excise.

At a special meeting of the Ashton-under-Lyne, Stalybridge, Dukinfield, and District Joint Water-Works Committee, held last Thursday, a resolution passed at a previous sitting, to accept the resignation of Mr. F. J. Dixon, the Water Engineer, was rescinded. It was stated that an amicable settlement of the differences which had arisen between Mr. Dixon and the Joint Board had been arrived at.

The Gas Committee of the Stockport Corporation have unanimously appointed Mr. Walter Stanley Sowerbutts Assistant Gas Engineer, in succession to Mr. E. G. Hutchinson, who, as already announced, has succeeded the late Mr. Keyte at Workington. The appointment, which, of course, is subject to the confirmation of the Town Council, is for a probationary period of six months, and will be made permanent at the end of that time. Mr. Sowerbutts is the youngest son of Mr. John Sowerbutts, J.P., of Stockport, and he received his technical education at the Stockport Technical School and the Manchester School of Technology. He has been at the Stockport Gas-Works for a period of 7½ years, during part of which time he was a pupil of Mr. S. Meunier, the Corporation Gas Engineer and Manager.

Mr. C. E. Ball, who has been for many years connected with the Ilfracombe Gas Company, and for some time held the position of Secretary, has been compelled to leave the town on account of ill-health. It was intended to offer him some token of regard at a dinner; but, owing to his state of health, a deputation, including Mr. J. Armstrong (the Engineer and Manager) and Mr. A. Norman (the Secretary), recently waited upon him at his house, and, on behalf of the Directors and staff, presented him with a massive solid silver inkstand, of Chippendale pattern, with two cut-glass bottles. The inkstand bore the following inscription: "Presented to Mr. C. E. Ball by the Directors, Staff, and Workmen of the Ilfracombe Gas Company, as a mark of esteem after 26 years' connection with the Company. September 18th, 1909." Mr. Ball, with much feeling, acknowledged the gift. The dinner took place in the evening at the Montebello Hotel—Mr. J. P. Ffinch, a Director of the Company, presiding. Mr. Ball and his family have since left Ilfracombe for Loughborough.

It is a pleasure to be able to record that Mr. Thomas Newbigging, who has been visiting Canada at the request of the Toronto Gas Company, to advise them in the matter of important extensions of their works, is back again in this country, delighted with his trip. As the result of his experience, he speaks enthusiastically of Canada. Business is "booming" there; and rapid developments are taking place in every direction. There is so much movement and confidence in the future, that it is a pleasure to be among it all. Naturally England, even the busy North, seems tame after this experience. Mr. Newbigging also speaks highly of the climate. Being bright and exhilarating, the feeling of lassitude so often felt here is entirely absent—from which it is evident that a trip to Canada is a "pick-me-up" of the very best kind. Though things may, generally speaking, run on quieter lines in England than over there, still Mr. Newbigging returns to find active times ahead of him. We learn that his firm are at present engaged on a valuation of the Manchester gas undertaking for rating purposes, and that they are preparing a scheme for the enlargement of the Douglas (Isle of Man) Gas-Works, where the consumption is increasing rapidly. In addition to this, they have four other extensions of gas-works on hand; and they have also reported recently on the proposed transfer of gas-works undertakings at Hoyland and Silkstone, Egremont (Cumberland), Penistone, and Thurlstone.

OBITUARY.

JOHN HENRY COX

We regret to record the death on Sunday, the 19th inst., at his residence at Moorfields, Cotherstone, of Mr. John Henry Cox, Secretary and Manager of the Sunderland Gas Company. Deceased, who had reached the advanced age of 84, had throughout his long life enjoyed wonderfully good health; but a year ago he had an illness which prevented him, for the first time since he became associated with the Company, from attending the annual meeting. He recovered and was able to resume his duties until about a month ago, when he again became ill with bronchial trouble, and went to his country residence at Cotherstone in the hope of benefiting by the change. His condition improved considerably; but a relapse followed, and death resulted from heart failure.

Mr. Cox was born at Ryton-on-Tyne, and went to Sunderland when quite a young man. Soon after taking up his abode there, he obtained the position of Secretary of the Gas Company, with which he was associated for the long period of sixty years. At the time of his appointment (1849), there were two Gas Companies in the town; and the competition between them was very keen. After a time, however, the second undertaking was acquired by the present Company, which at that time was a struggling concern. Under Mr. Cox's able management, the business very rapidly increased until it reached its present dimensions. Mr. Cox's heart was always thoroughly in his work, to which he gave unremitting attention, being at his office early and late. It may be remembered that in the article on the installation of Dessau vertical retorts at the Company's Ayres Quay works which appeared in the "Journal" for the 6th of July, it was mentioned that the system had been adopted on the advice of the Engineer (Mr. C. Dru Drury), with the approval of Mr. Cox, whose interest in the Company, notwithstanding his sixty years' service, remained unabated, and to whom all matters of construction and policy were still finally referred. In 1899, on the occasion of the jubilee of his connection with the Company, the Directors presented him with a cheque for 250 guineas. Presentations were also made to him by the office staff, the workmen, and by the North of England Gas Managers' Association, of which he was one of the founders, a member of the first Committee, and a Past-President—the

Association's gift taking the form of an illuminated address. He joined the British Association of Gas Managers in 1866, and passed into the Gas Institute; but he left it in company with the other members who formed the first Institution. On the reunion taking place a few years ago, Mr. Cox enrolled himself as a member of the reorganized body. He was the oldest Director of the Sunderland and South Shields Water Company, a Director of the Elswick Coal Company, Newcastle, and a member of the Institution of Mining Engineers. He took no part in the public affairs of Sunderland, but was well known in all business circles in the town and district, and was held in high esteem among all classes of the community, and especially by his professional brethren, though, of course, he was less well known to the younger members of the gas industry than to their seniors. He leaves a widow, two sons, and one daughter. The eldest son is Dr. Burdon Cox and the younger Mr. Norman S. Cox, the Assistant-Secretary of the Sunderland Gas Company.

The funeral took place last Wednesday, at Bishopwearmouth Cemetery; the interment being preceded by a service in Christ Church, Sunderland. There was a large attendance of workmen, officials, directors, and others connected with the Sunderland Gas Company, as well as many other gentlemen desirous of showing the high esteem in which they held Mr. Cox. Among those present were Alderman Richardson (the Chairman of the Company), Mr. J. Morley Longden (Solicitor), Mr. Charles Hawksley (Consulting Engineer), Mr. C. Dru Drury (Engineer), and Messrs. R. H. Gayner and G. B. Gibbs (Chairman and Secretary of the Sunderland and South Shields Water Company). The North of England Gas Managers' Association were represented by the President and Vice-President (Messrs. T. H. Duxbury and John Lewis). The procession included upwards of 200 of the Gas Company's workmen, who marched behind the carriages.

The "Journal für Gasbeleuchtung" reports the recent death of Herr August Zschimmer, the Manager of the Fürstenwalde Gas-Works. He had reached the age of 75 years.

The death occurred rather suddenly recently, at his residence at King's Heath, Birmingham, of Mr. William Beal. Deceased was a native of London; but in 1862 he went to Birmingham, where he established himself as a manufacturer of gas-fittings. According to an obituary notice in the "Ironmonger," he for many years waged a vigorous warfare against the Birmingham Corporation on the question of municipal trading, particularly in regard to the erection and maintenance of gas-fittings and heating and cooking appliances. His place of business was in the centre of Birmingham, and he built up a large trade; but bit by bit it was taken from him by the Gas Department. He then fought the department in the Press, at public meetings, and at the November elections. Wherever opportunity offered, he was to the front denouncing the Municipality for using the money contributed by gas-fitters in the way of rates for the purpose of ruining them in their business. But he fought alone. The demand he made of the Corporation officials was that now made by the Ironmongers' Federated Association—viz., that the work of the Municipality should really stop at the meter. When in more recent years the Master Gas-Fitters' Association joined hands with the local Ironmongers' Association in an endeavour to obtain the removal of the same grievance, Mr. Beal took no part in the work. He felt that if the trade had rallied round him in the early days of the controversy, some good might have been done; but he thought that to attack the system when it had become the settled policy of the Corporation was useless.

Gaslight & Coke Company's Calorific Power Standard & Price.

In the "Journal" last week, we referred in detail to the above subject, and quoted sub-section 1 of section 39 of the Act amalgamating the Gaslight and Coke Company with the West Ham Gas Company, in which it is set forth that "as from the 1st day of January, 1910, the standard calorific power of the gas supplied by the Gaslight Company within the Gaslight district and the West Ham district shall be 125 calories net per cubic foot," &c. It appears, however, that the Company are about to anticipate the date mentioned in the Act, and have given notice to the Local Authorities accordingly; for, at the meeting of the Court of Common Council of the City of London last Thursday, the Streets Committee submitted a letter from the Company stating that the price of gas for street lighting would be reduced from 2s. 4d. to 2s. 2d. per 1000 cubic feet as from the date of recording the meter indices for the September quarter, and that the standard illuminating power of the gas supplied would be 14 candles, instead of 16 candles as at present. This action on the part of the Company brings to mind the statement made at the end of the report of the deputation of the Streets Committee of the Corporation on the lighting of Continental cities, given in the "Journal" for July 20 last: "The price of gas for public lighting up to Midsummer was 2s. 5d. per 1000 cubic feet; but this amount was then reduced by 1d., and a further reduction of 2d. per 1000 cubic feet will be made as from Jan. 1, 1910, when the Gaslight and Coke Company will reduce the illuminating value of their gas from 16 to 14 candles, under their Bill now before Parliament, which has passed the third reading of the House of Commons. The effect of these reductions will be to decrease the annual cost of the newest type of high-pressure inverted gas-lamp, as in Fleet Street, from £16 10s. to £15 2s. 6d., and all other gas-lamps proportionately."

THE LUNGE CELEBRATION AT ZURICH.

The seventieth anniversary of the birth, and the fiftieth of the doctorate, of Professor George Lunge, whose works on "Coal Tar and Ammonia" and "Sulphuric Acid and Alkali" are well known to many of our readers, was celebrated with much enthusiasm at Zurich on the 19th inst. According to an account of the proceedings specially contributed to the "Chemical Trade Journal," the official celebration took place in the gaily decorated lecture theatre of the Technical Chemical Laboratory; and when Professor Lunge advanced to the table from behind which he had for so many years addressed his students, the whole company rose to greet him with prolonged cheering and applause.

Professor Bosshard, Professor Lunge's successor in the Chair of Chemical Technology, opened the proceedings by congratulating the Professor in the name of the staff of the Federal Polytechnic and of the Federal officials. After referring to the vast influence which he had won, not only over the intellects but also over the hearts of his countless students, the speaker presented two birthday gifts. The first was a cheque for 40,000 frs. (£1600), collected among Professor Lunge's friends and disciples, and which was to form a "Lunge Fund," to be disposed of as its recipient might direct. The second gift was of a more personal nature, and took the form of a golden plaque, bearing on one side an excellent likeness of the master, and on the other showing him at work among the apparatus for which the world has to thank his genius. Professor Bosshard was followed by ten other speakers, each bearing the congratulations of a section of the chemical world, and bringing some lasting token of love and esteem.

On rising to reply, Professor Lunge was greeted with deafening applause. When the cheering finally subsided, the speaker said he dared not accept a fraction of the praise which his friends had showered upon him. Passing to reminiscences of his earlier life, he described his first connection with Zurich. He said that if he had had any success as a teacher, it had been largely due to the hearty co-operation of his colleagues, and, above all, of the unforgettable Victor Meyer. Finally he expressed his heartfelt thanks for the magnificent sum which had been, and was being, collected to do honour to his name. This he would ask the Federal authorities to invest—devoting the accruing interest to helping students who had secured their diploma, but who were unable, for lack of funds, to carry on post-graduate work.

As soon as the applause that this speech excited had ceased, Professor Bosshard rose to thank Professor Lunge for this new manifestation of untiring interest in the welfare of his students. The official celebration ended with a banquet, after which the gathering dispersed.

GAS ACTS FOR 1909.

[Second Article.]

We continue to-day a review of the Acts that have been obtained this session to give extended powers to a number of statutory Gas Companies.

If the Bill of the Alliance and Dublin Consumers' Gas Company (as noticed on Jan. 12 last) was of more than ordinary interest, the Act that has issued from it is even more so. The section of the Act dealing with works has been considerably modified. It will be remembered that the Company proposed to construct a conveyor or gantry over and along the side of Sir John Rogerson's Quay; and there were a number of clauses with reference to the carrying out of works on the River Liffey—all of which had for their purpose the provision of facilities for dealing with the transport of material to and from the works of the Company. Many of these clauses have been deleted; but there are other works described which will give the Company improved facilities in this respect, though not to the extent originally required. The cause of the alteration no doubt finds expression in this provision that appears in the Act: "Provided that, notwithstanding anything shown on the deposited plans, the Company shall not, under the powers of this Act, enter upon, or take, or use, Sir John Rogerson's Quay or any part thereof, or lay down or construct thereon any overhead construction or other work." Authorization is given to the Company to provide for the operation by electrical energy of the works described, provided that the electrical energy is so used as to prevent any interference with the telegraphs belonging to the Postmaster-General. The works in view are to be constructed within five years; otherwise the power lapses. Lands are described that the Company are given power to acquire; and sanction is granted to the construction of works upon scheduled lands. The extensions of the limits of supply named in the Bill are absent from the Act. The ordinary shares of the Company are to be consolidated and converted into stock of the nominal amount of £1,551,868, bearing a uniform dividend of 5 per cent. The Company's standard price was not mentioned in the Bill; but in the negotiations, it has suffered some reduction. A clause now provides that in Dublin, Rathmines and Rathgar, Pembroke, Blackrock, and in the District Electoral Division of Donnybrook, the standard price is to be 3s. 7d. per 1000 cubic feet: "Provided always that the price charged in the urban districts of Rathmines and Rathgar, Pembroke, Blackrock, and Kingstown, and in the District Electoral Division of Donnybrook, shall not exceed

the price for the time being, and from time to time charged, in the City of Dublin." The sliding-scale as to dividend is to operate half-yearly; 1d. variations from the standard price causing the standard dividend of 5 per cent. to rise or recede by 1s. 3d. per cent. The price charged for gas in Dalkey, Killiney, Ballybrack, and Terenure, is not to be more than 3d., and within the remainder of the county of Dublin (other than as specified above) not more than 6d., and in the county of Wicklow not more than 1s. 2d. per 1000 cubic feet, in excess of the price for the time being charged in the City of Dublin as now constituted; but the Company are, when the circumstances are similar, to allow like discounts within these limits of supply as within the city. These excess prices, however, are not to affect the dividend of the Company. Power is conceded for the raising of additional capital to the extent of £300,000, instead of £400,000 as requested in the Bill; and to the issue of the additional capital the new auction clauses will apply. The usual one-third borrowing power is allowed. Provision is made for a special reserve fund; and there is also the stipulation as to the carry-forward not exceeding the amount required to pay a year's dividend. The ordinary form of prepayment clause appears. The quality of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. Within twelve months of the passing of the Act, the Company may be required by any consumer to fix free of charge on his premises a sufficient number of flat-flame burners suitable for the prescribed illuminating power; and further—

The Company shall, if required by any person who shall be supplied with gas by means of a prepayment meter, supply, and fix free of charge in connection with such meter one incandescent burner with mantle and chimney in such position as such person may desire.

The Company have obtained relief in respect of sulphur compounds. As to the price of gas for public lighting, it is to be "at the lowest rate charged by the Company to any private consumers otherwise than by special contract in writing." It is also ordained that no capital raised under the Act is to be applied to the supply of electricity by the Company, or to the purchase, providing, or maintaining of any works, machinery, or appliances for that purpose unless with the sanction of the Board of Trade. It is also enacted that any part of the county of Wicklow (other than Bray) which is not, at the passing of the Act, supplied with gas by the Company shall, as from the passing of the Act, cease to be within the limits of the Company's supply. The arrangement entered into by the Corporation with the Company for the price of gas to be dependent on the price of coal during the next three years, does not form part of the Act; but an explanation as to its terms has been published on more than one occasion in our columns—briefly in the "JOURNAL" for Sept. 7, p. 620. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Eastbourne Gas Company's Act shows that the extension of the limits proposed in their Bill has been considerably curtailed, owing to the action of the outside authorities concerned. The Company will now embrace Arlington, Hailsham, Hellingly, and so much of Hurstmonceux as is not included in the limits of supply of the Bexhill Water and Gas Company. The Company are to be allowed to charge within the extended limits 5d. per 1000 cubic feet in excess of the sum from time to time charged by them for gas supplied within the existing limits; but any excess sum so charged is not to be taken into account in calculating the rate of dividend payable. To supply the new areas, the Company are empowered to lay connecting mains through certain districts that they had contemplated supplying, but which have been cut out of their project. The arrangement for the transfer of the Hailsham Gas Company's property is confirmed; and the holders of shares in the Company will receive in exchange for each £10 share £15 of 5 per cent. preference stock. Lands are scheduled on which additional works may be constructed. The Act has been considerably enlarged from its original form by the inclusion of pages of clauses for the protection of various authorities. Authorization has been given to the conversion of share capital into "A" and "B" stocks, carrying respectively standard dividends of 5 and 3½ per cent.; and, in consequence, the operation of the sliding-scale will now provide variations of 2s. 6d. in dividend instead of 5s. A special purposes fund is provided for; and it is enacted that the amount carried forward is not to exceed the equivalent of a year's dividend. For the testing of the Company's 14-candle standard gas, the use of the "Metropolitan" No. 2 burner is prescribed. The proposal for the adoption of the old 10 and 15 per cent. discounts clause has been dropped; and section 13 of the Gas-Works Clauses Act, 1847, has been extended in the manner proposed by the model clause so as to give liberty when making contracts. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

In its effects, the most important Act of the session is that of the Gaslight and Coke Company. There are really three significant sections, in which there are sanctioned the scheme for the transfer of the West Ham Gas Company, the lowering of the illuminating standard of the gas supplied in the Gaslight and Coke area to 14 candles as tested by the "Metropolitan" No. 2 burner, and the inauguration of statutory penalty testing for calorific power. We will dismiss this last matter at once by a reminder that the calorific power clauses were reproduced *in extenso* in last week's issue. The West Ham Company will be absorbed as from Jan. 1 next; but it will continue incorporated until April 1 for the purpose of enforcing the provisions of any agreement which may have been entered into prior to the date of transfer. After that date there is to be final dissolution. In the whole, the holders of West Ham ordinary stock are to receive £121 of ordinary stock in the Gaslight and Coke Company for every £100 of West Ham stock held. To meet £118 of this amount, the necessary ordinary stock of the Gaslight Company is to be created; but the balance of £3 of stock is to be obtained by purchase in the open market by the Company out of the amount standing to the credit of the reserve fund. The holders of 5 per cent. preference stock in the West Ham Company are to receive at the rate of £125 per cent. of the 4 per cent. preference stock of the Gaslight and Coke Company; and holders of 4 per cent. debenture stock in the West Ham Company will receive at the rate of £133 6s. 8d. per cent. of the 3 per cent. debenture stock of the Gaslight Company. For fractional parts of £5 of stock, the Gaslight Company are to pay to the holder a sum in cash equal to its value at the market price on the day of transfer. Provision is made for the payment of the dividend of the West Ham proprietors to Dec. 31 next. The unexercised powers of the West Ham Company of raising capital and borrowing are repealed. The provisions of the Gaslight Acts are made to apply to the annexed district. The West Ham Council are to provide a testing-place at the Canning Town Public Hall; and the Company are to provide the necessary apparatus. Thereafter the testing-place at the Silvertown Gas-Works is to cease to be a prescribed testing-place. In the new testing-place, the mode of testing is to be the same as is prescribed by the Metropolitan Gas Referees. The Gas Examiner in the West Ham district may test for purity and pressure at any time of the day or night, and the illuminating power between the hours of five and eleven o'clock in the afternoon. But in the West Ham district, not more than one controlling authority is to be entitled to recover any forfeiture in respect of defective illuminating power, excess of impurity, insufficiency of pressure, or defective calorific power. One of the West Ham Directors [effect has already been given to this] is to join the Board of the Gaslight Company; and the remaining Directors of the West Ham Company are to receive, as compensation for loss of office, an equivalent of six years of their respective annual remuneration as Directors calculated upon the average of the three years immediately preceding the date of transfer, or in the case of any Director who has served for a period of less than three years, upon the average of such less period—the compensation to be paid within three months of the date of transfer. The Auditors are to receive a sum equal to three years' remuneration. The officers of the West Ham Company will go over to the Gaslight Company; but provision is made for retirement in the case of any officer with fourteen years' service at his back in the West Ham Company, upon either the Gaslight Company or the officer concerned so desiring, and for compensation by agreement or arbitration. For the protection of the West Ham Corporation, the following clause appears:

The Gaslight Company shall not close the existing works of the West Ham Company situate within the borough for the period of ten years from the date of transfer, but during such period the Company shall continue the manufacture of gas at such works, and carry on the same as a manufacturing gas-works, substantially on the same scale as they were carried on by the West Ham Company during the year prior to the introduction of the Bill for this Act.

A clause is inserted for the protection of the Chigwell, Loughton, and Woodford Company. It appears that the West Ham Company are, by agreement with the Chigwell Company, supplying gas in part of the area of the latter. This is to be continued by the Gaslight Company; and by arrangement there may be extensions. The Chigwell Company, however, have liberty given to them to give specified notification to the Gaslight Company to cease to supply gas in the area in question; but within a month of the expiration of the notice, the Chigwell Company are to pay the Gaslight Company the value of all mains, pipes, meters, fittings, works, materials, and apparatus of the Gaslight Company in the area in question. Failing agreement, the value is to be determined by arbitration. The standard price for gas of the Gaslight and Coke Company (under agreements effected with the London County Council) is reduced to 3s. 2d. per 1000 cubic feet; and the sliding-scale is to apply half yearly (the standard rate of dividend being 4 per cent.) by increments or decrements of 1s. 4d. per cent. for variations of 1d. down or up in price. The illuminating power of the gas is reduced to 14 candles. The burners of the prepayment consumers are to be changed within a reasonable period for suitable ones for the lower illuminating power gas; and other consumers can have any flat-flame burners exchanged for suitable ones within two years. Provision is made for the consumers south of the Thames obtaining a diminution of price in respect of the lowering of the gas from 16 to 14 candles, under section 39 of the scheme for the amalgamation of the London Gaslight Company with the Gaslight and Coke Company in 1883. The remuneration of the Directors of the Company is to be such a sum, not being more than £7500 or less than £5500, as the Directors may from time to time themselves determine. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The death occurred suddenly on the 19th inst., at his residence in Buxton, in his 74th year, of Mr. Keighley Walton, who was for many years Town Clerk of Halifax—a position which he relinquished in April last. Deceased served under 28 Mayors, and conducted proceedings in connection with 7 Local Acts and 14 Provisional Orders.

SIMULTANEOUS EXTRACTION OF AMMONIA AND SULPHURETTED HYDROGEN WITH SIMULTANEOUS OXIDATION OF THE LATTER INTO SULPHURIC ACID.

By WALTHER FELD, of Linz, Germany.

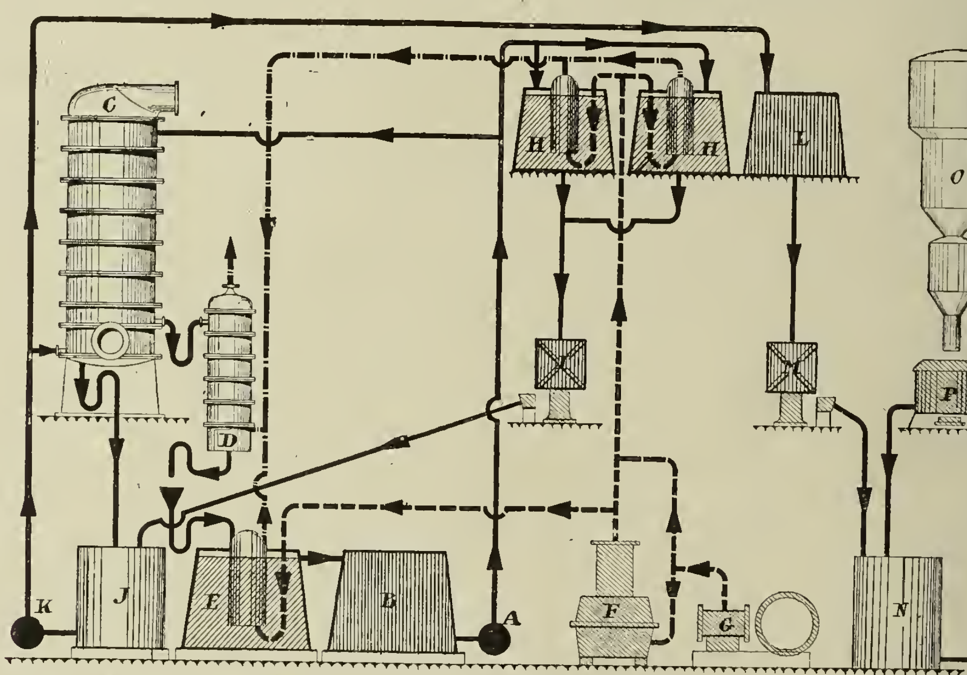
[Written in View of the Inspection of the East Hull Gas-Works by the Eastern Counties Gas Managers' Association.]

THE process inspected by the members of the Eastern Counties Gas Managers' Association at the East Hull Gas-Works consists of apparatus for the elimination of sulphuretted hydrogen only. Since this plant has been ordered, the process has been further improved; and it now extracts the ammonia and the sulphuretted hydrogen simultaneously—oxidizing at the same time an amount of sulphuretted hydrogen equivalent to the ammonia in the gas. The ammonia is thus obtained in the form of a strong solution of sulphate of ammonia, without any further distillation, and without using sulphuric acid for its formation—the sulphur extracted from the gas being utilized for this purpose.

The process is based on principles similar to those bearing on the elimination of sulphuretted hydrogen alone, as already explained to you.* The active reagents referred to in the following description are ferrous sulphate, thiosulphate, and thionates.

The gas containing ammonia and sulphuretted hydrogen is at first washed in a "Feld" washer with a weak solution of ferrous sulphate. Ammonia sulphate is formed, and iron sulphide is precipitated. The liquor running from the gas-washer is treated with sulphur dioxide (which is mixed with an excess of air) obtained by burning sulphur. By the simultaneous action of sulphur dioxide and air upon the iron sulphide, free sulphur is precipitated; and soluble ferrous thiosulphate, thionate, and sulphate is formed. The liquor so regenerated is again used for treating the crude gas; but the reaction is now somewhat different. The ammonia and sulphuretted hydrogen in the gas are again absorbed, and iron sulphide, together with free sulphur, is precipitated; while soluble sulphate, thiosulphate, and thionate of ammonia is formed. Whereas at the beginning of the process, when using ferrous sulphate only, about as much of the sulphuretted hydrogen is eliminated as is equivalent to the ammonia, now an excess of the former is extracted—being on an average as much as 135 per cent. on the ammonia. This is due to the presence of the thiosulphate and the thionates in the liquor.

The liquor is alternately treated with crude gas and sulphur dioxide until it contains between 30 and 45 per cent. of ammonia salts. It then represents a mixture of ammonia sulphate, thiosulphate, and thionate, some undecomposed iron salt, a precipitate of iron sulphide, and free sulphur, and is ready for oxidation. This oxidation is necessary to transform the thiosulphates and thionates into sulphates. With this object, the hot liquor is treated with sulphur dioxide and a surplus of air. By the simultaneous action of the sulphur dioxide and the oxygen of the air upon the hot liquor, the ferrous sulphide is dissolved, and the thiosulphates and thionates are oxidized into sulphate; free sulphur being precipitated. When the oxidation is complete, the liquor contains about 30 to 45 per cent. of sulphate of ammonia, the original amount of ferrous sulphate in solution, and all the sulphur extracted from the gas in the form of free precipitated sulphur. The sulphur is now separated from the liquor by filtration, and washed in a filter-press. Part of the sulphur thus recovered



Feld's Plant for the Simultaneous Extraction of Ammonia and Sulphuretted Hydrogen with Simultaneous Oxidation of the Latter into Sulphuric Acid.

rom the gas is burnt in a sulphur-oven to sulphur dioxide, which is used in the process as mentioned above, and is finally oxidized into sulphuric acid, forming sulphate of ammonia. The rest of the sulphur is for sale.

The liquor coming from the filter-press, and containing soluble sulphates of ammonia and iron, is now ready for final treatment. For this purpose, the liquor is treated with crude gas, containing sulphuretted hydrogen and ammonia, by the action of which two compounds the ferrous sulphate is decomposed, forming again insoluble iron sulphide and soluble ammonia sulphate. As soon as all the iron is precipitated, it is separated from the liquor by filtration—the liquor then containing only a pure and strong solution of sulphate of ammonia, from which the sulphate is obtained by evaporation.

The residue in the filter-press, being iron sulphide with some ammonia sulphate liquor, is mixed with fresh water or virgin liquor, and treated with sulphur dioxide. Soluble ferrous, thiosulphate, thionate, and sulphate is formed, which is again used for the extraction of ammonia and sulphuretted hydrogen.

The following equations explain the process:—

(1) First washing:

$$2\,FeSO_4 + 4NH_3 + 2H_2S = 2FeS + 2(NH_4)_2SO_4.$$

(2) Regeneration of iron liquor:

$$2FeS + 3SO_2 = 2FeS_2O_3 + S.$$

(3) Second and further washings:

$$2\,FeS_2O_3 + 4NH_3 + 2H_2S = 2FeS + 2(NH_4)_2S_2O_3.$$

(4) Oxidation:

$$2FeS + 2(NH_4)_2S_2O_3 + 3SO_2 + 4O = 2(NH_4)_2SO_4 + 2FeSO_4 + 5S.$$

Then follows the filtration of the sulphur.

(5) Final precipitation of iron:

$$2(NH_4)2SO_4 + 2FeSO_4 + 4NH_3 + 2H_2S = 4(NH_4)_2SO_4 + 2FeS.$$

Then follows the filtration of FeS, leaving a pure solution of ammonium sulphate.

According to these equations, $2NH_3$ are equivalent to $1H_2S$, or 34 grains of ammonia are equivalent to 34 grains of sulphuretted hydrogen. Therefore, 1 grain of sulphuretted hydrogen should be absorbed by 1 grain of ammonia. It will be seen from the tables, that in using regenerated liquors, for each 100 parts of ammonia absorbed about 135 parts of sulphuretted hydrogen are eliminated from the gas. This proves that besides the simultaneous extraction of ammonia, and a corresponding part of sulphuretted hydrogen, a further elimination of the latter is going on in the same operation, according to the process adopted by the East Hull Gas Company.

The tables show the results that were obtained in a small plant in which sulphate of zinc and sulphate of iron were used for the washing process: Column 1 shows the strength of the liquor in $ZnSO_4\ 7H_2O$, or $FeSO_4\ 7H_2O$. Column 2 gives the amount of washing salt decomposed after having been in use for some time. Column 3 shows the quantity of gas treated per 24 hours. Column 4 shows the temperature at which the gas has been treated. Column 5 gives the ammonia in grammes per cubic metre of gas before and after treatment. Column 6 gives the same figures for sulphuretted hydrogen. Column 7 shows the percentage of

*See "JOURNAL," Sept. 21, p. 761.

TABLE A.—*Simultaneous Extraction of Ammonia and Sulphuretted Hydrogen with Zinc Salt.*

[1 cubic metre = 35·3 cubic feet.]

—	Liquor.		Gas.				
	Zn SO_4 $7H_2O$.	Zn SO_4 $7H_2O$. Decomposed.	Quantity per 24 Hours.	Temperature.	Ammonia. Grs.	Sulphur. Grs.	Sulphur on NH_3 absorbed.
	Per Cent.	Per Cent.	cb.m.	Deg.	Per cb.m.	Per cb.m.	Per Cent.
March 23, 1909.							
Inlet of washer	17·9	..	1630	25	5·08	12·86	..
Outlet of washer . . .	..	..	..	..	0·04	6·57	..
Extracted, g. p. cb.m. . .	..	..	..	..	5·04	6·29	123·7
Extracted, per cent. . .	..	..	..	..	99·22	48·7	..
March 24, 1909. After 24 hours:—							
Inlet of washer . .	..	..	1390	25	4·68	14·08	..
Outlet of washer . .	..	..	..	..	0·01	7·99	..
Extracted, g. p. cb.m.	..	..	..	..	4·67	6·09	130
Extracted, per cent. .	..	..	..	..	99·72	43·02	..
April 9, 1909. (*a*) After 1 hour:—							
Inlet of washer . .	12·2	..	1225	24	3·76	11·73	..
Outlet of washer . .	..	..	..	..	0·14	6·48	..
Extracted, g. p. cb.m.	..	..	..	..	3·62	5·25	145
Extracted, per cent. .	..	..	..	..	96·4	44·7	..
(*b*) After 3 hours:—							
Inlet of washer . .	..	..	..	..	4·01	13·43	..
Outlet of washer . .	..	..	..	..	0·19	6·93	..
Extracted, g. p. cb.m.	..	..	..	..	3·82	6·50	171
Extracted, per cent. .	..	..	..	..	95·3	48·2	..
April 10, 1909. (*a*) Beginning of 1st hour:—							
Inlet of washer . .	11·3	..	50,000	35	..	..	..
(*b*) After 2 hours:—							
Inlet of washer . .	5·1	54·9	..	..	6·99	13·15	..
Outlet of washer . .	..	..	..	..	0·09	6·30	..
Extracted, g. p. cb.m.	..	..	..	..	6·90	6·85	99·2
Extracted, per cent..	..	..	..	..	98·70	51·9	..
(*c*) After 3 hours:—							
Inlet of washer . .	2·4	78·8	..	..	6·88	13·15	..
Outlet of washer . .	..	..	..	..	0·09	6·73	..
Extracted, g. p. cb.m.	..	..	..	..	6·79	6·42	94·4
Extracted, per cent. .	..	..	..	..	98·6	49·1	..
(*d*) After 4 hours:—							
Inlet of washer .	0·26	97·7	..	..	5·40	13·15	..
Outlet of washer . .	..	..	..	..	0·10	5·50	..
Extracted, g. p. cb.m.	..	..	..	..	5·30	7·65	144
Extracted, per cent. .	..	..	..	..	98·0	58·2	..

sulphuretted hydrogen eliminated, based on ammonia extracted. It must be remembered that, theoretically, per 100 parts of ammonia only 100 parts of sulphuretted hydrogen should be eliminated.

The tests on April 10, June 29, July 19 and 20 were made to demonstrate that the extraction of ammonia and of sulphuretted hydrogen is complete even when the solution of the metallic salt is nearly completely saturated. Even at so low a percentage as 0·14 per cent. of ferrous sulphate, the absorption of both compounds NH_3 and H_2S was a good one.

From the tables it will further be seen that the extraction of ammonia is complete even at a temperature of 35° C. It will be equally complete at 50° C., and even above.

The diagram shows a complete plant for this process. The washing liquor is pumped by pumps A from the tank B to the washer C, in which all the ammonia and a corresponding part of the sulphuretted hydrogen are absorbed. The washer used is one of Feld's centrifugal washers. The liquor leaving the washer passes through the still D, and is collected in the tank E, which is the regenerator. In both appliances the liquor meets with sulphur dioxide and air coming from the sulphur-oven F and from the air-pump G. By the action of sulphur dioxide and air, the sulphide of iron formed in the washer is decomposed and the iron salt regenerated. By an overflow the liquor runs from the tank E to the tank B, whence it is continuously pumped upon the washer. By the continued alternative action of crude gas and sulphur dioxide upon the liquor, ammonia sulphate and free sulphur are formed.

The washing and regenerative process may continuously go on, without any control, except the testing of the strength of the liquor, which may be done every ten or twelve hours. Even if this control should not be attended to, there is no chance of ammonia escaping, as the absorbing power of the liquor, which is continuously regenerated in the tank E, is not diminished, as explained by the tables. As soon as the liquor contains 30 to 45 per cent. of ammonia sulphate and a corresponding amount of sulphur (which may be the case after ten or twenty hours, according to the quantity of liquor in circulation), the liquor is pumped from the tank E to one of the tanks H. Meanwhile, tank B is filled with fresh liquor.

The tanks H serve the purpose of complete oxidation of the salts in the liquor into sulphates. By this oxidation the sulphur is precipitated, and is then separated from the liquor and washed in the filter-press I. Part or all of the sulphur is burnt in the sulphur-oven F by air coming from the air-pump G. The sulphur dioxide thus formed and air are used for the regeneration and oxidation of the liquid in the tanks E and H, as above stated.

The liquor coming from I and containing sulphate of ammonia and sulphate of iron is collected in the tank J and continuously pumped by the pump K into the lowest or finishing chamber of the washer C. The object of this is to precipitate the iron completely from the ammonia sulphate solution. For this purpose, the liquor runs for about six to ten hours continuously through the finishing chamber of the washer; no control being necessary. It does not interfere with the completeness of the process if the liquor runs even some hours longer through this chamber than required. After the liquor is completely decomposed, it consists of a small quantity of iron sulphide mud and a concentrated solution of ammonia sulphate. The liquor is now pumped to the tank L, where it is cleared by standing for some hours. After the liquor is nearly clear, it is filtered by the filter-press M and collected in the tank N. Only one filtration every twelve hours is necessary. The iron sulphide mud in the tank L and from the filter-press M, which contains some ammonia sulphate solution, is (without being washed) run to the regenerator E, where it is mixed with fresh water or virgin liquor, and used again for feeding the washer C after being treated with sulphur dioxide.

The clear sulphate of ammonia solution in the tank N, containing about 30 to 45 per cent., is concentrated and crystallized in the vacuum boiler O. The crystals are separated from the mother liquor in the centrifugal apparatus P.

TABLE B.—*Simultaneous Extraction of Ammonia and Sulphuretted Hydrogen with Iron Salt.*

[1 cubic metre = 35·3 cubic feet.]

—	Liquor.		Gas.				
	Fe S O_4 $7H_2O$	Fe S O_4 $7H_2O$ Decomposed.	Quantity per 24 Hours	Temperature.	Ammonia. Grs.	Sulphur. Grs.	Sulphur on NH_3 Absorbed.
	Per Cent.	Per Cent.		Deg.	Per cb.m.	Per cb.m.	Per Cent.
June 29, 1909. (*a*) Beginning of 1st hour .							
Inlet of washer . .	13·9	..	1875	..	3·97	11·3	..
Outlet of washer . .	..	..	..	..	0·04	6·04	..
Extracted g. p. cb.m..	..	..	..	..	3·93	5·26	134
Extracted, per cent. .	..	..	..	..	99·0	46·5	..
(*b*) After 2 hours—							
Inlet of washer . .	..	..	..	..	4·50	10·9	..
Outlet of washer . .	..	..	..	..	0·07	5·8	..
Extracted, g. p. cb.m.	..	..	..	..	4·43	6·1	138
Extracted, per cent. .	..	..	..	..	98·0	51·0	..
(*c*) After 4 hours—							
Inlet of washer . .	6 5	45	..	..	4·5	10·5	..
Outlet of washer . .	..	..	..	..	0·07	4·7	..
Extracted, g. p. cb.m.	..	..	..	..	4·43	5·8	139
Extracted, per cent. .	..	..	..	..	98·0	55·0	..
(*d*) After 8 hours—							
Inlet of washer . .	..	98	..	..	1·8	9·6	..
Outlet of washer . .	..	..	..	..	0·04	5·7	..
Extracted, g. p. cb.m.	..	..	..	..	1·76	3·9	220
Extracted, per cent. .	..	..	..	..	97·7	40·0	..
July 17, 1909. With fresh absorbing liquor							
(*a*) Beginning of 1st hour .	13·9	..	1620	29	..	..	..
(*b*) After 2 hours . . .	11·74	15·5	..	..	..	..	..
(*c*) After 3 hours—							
Inlet of washer . .	..	..	..	..	5·36	12·86	..
Outlet of washer . .	..	..	..	..	0·117	5·58	..
Extracted, g. p. cb.m.	..	..	..	..	5·243	7·28	138
Extracted, per cent. .	..	..	..	..	98·0	56·6	..
(*d*) After 8 hours . . .	1·6	88·4	..	..	..	..	..
(*e*) After 8½ hours . . .	0·14	99	..	..	0·06	..	..
July 20, 1909. With regenerated liquor.							
(*a*) After ½ hour—							
Inlet of washer . .	..	..	1080	25	4·76	12·83	..
Outlet of washer . .	..	..	..	..	0·02	6·99	..
Extracted, g. p. cb.m.	..	..	..	..	4·74	5·84	123
Extracted, per cent. .	..	..	..	..	99·6	48·5	..
(*b*) After 3 hours—							
Outlet of washer . .	..	..	..	..	0·0056	..	..
(*c*) After 6 hours—							
Outlet of washer . .	..	..	..	..	0·0085	..	..
(*d*) After 8½ hours—							
Outlet of washer . .	0·14	99	2160	..	0·0056	..	..

The gas to be treated by the process should pass a tar-washer and a Pelouze apparatus to produce pure ammonia salt. Any cyanide extracted with the ammonia is precipitated with the sulphur in the oxidation tank, filtered with the sulphur, and burnt with it.

The liquor used for the extraction of ammonia and sulphuretted hydrogen is regenerated with practically no loss. If there is more sulphuretted hydrogen in the gas than is equivalent to the ammonia, a surplus of sulphur is recovered. This may be sold. If there is less, sulphur from any other source may be used in the sulphur-oven. Also other gases, containing sulphur dioxide, may be used for the regeneration of the iron solution from the iron sulphide.

The process offers the following advantages for gas, coke, and producer plants.

A.—Ammonia.

1. The extraction of ammonia is equally good in summer and winter.
2. The ammonia is obtained in the form of a concentrated solution of ammonia sulphate.
3. No fresh water is required for the extraction of ammonia.
4. Any liquors resulting from premature condensation are completely absorbed in the new process.
5. The distillation of ammonia liquor is avoided.
6. No sulphuric acid is used for the absorption of ammonia. The sulphur equivalent to the ammonia is oxidized in the washing process.

B.—Sulphuretted Hydrogen.

7. From 60 to 80 per cent. of the total sulphuretted hydrogen is simultaneously extracted with the ammonia.
8. The only reagent consumed for the oxidation of sulphuretted hydrogen into sulphuric acid in this process is atmospheric oxygen, but none of this air is introduced into the gas.
9. So much of the sulphuretted hydrogen as is equivalent to the ammonia in the gas is recovered in the form of ammonia sulphate—that is to say, one part by weight of sulphuretted hydrogen for each part of ammonia present in the gas.
10. After the first washing liquors—*i.e.*, iron or zinc salts—have been formed, no chemicals whatever are required; the material for oxidation and extraction being used over and over again. The mechanical loss of material is insignificant.
11. By the simultaneous extraction of ammonia and sulphur, the purifiers are relieved to the extent of about two-thirds.
12. The process may be extended, with some modifications, to the complete extraction of the sulphuretted hydrogen.

C.—Apparatus.

13. The complete plant for ammonia and sulphuretted hydrogen extraction consists of a gas-washer, regenerating, oxidizing, and evaporating plant, centrifugal apparatus, sulphur-oven, two filter-presses, pumps, tanks, and accessories.
14. The plant may be erected in any ordinary building—not much space being necessary.
15. If a larger amount of sulphuretted hydrogen is to be extracted than corresponds to the ammonia in the gas, two more washers and certain accessories will have to be added.
16. The consumption of power and steam is low. The heat regenerated by the oxidation of the sulphuretted hydrogen into sulphur dioxide and sulphuric acid is used for the evaporation of the liquor of premature condensation.
17. The whole plant is simple. The efficiency of the apparatus is independent of the workman's skill, and is always uniformly complete.

Water-Hammer in Steam-Pipes.

The Manchester Steam Users' Association have issued a memorandum by their Chief Engineer (Mr. C. E. Stromeyer), in which he gives a detailed investigation of more than a hundred Board of Trade reports dealing with cases of water-hammer in steam-pipes. As the result of his inquiry, he comes to the conclusion that safety from water-hammer can be assured by placing the junction-valve of a single boiler at the highest point of the steam-pipe range, and leading a horizontal pipe, or an inverted L-pipe, to the engine, so that under no condition can water lodge in a horizontal or slightly slanting pipe over either the engine or the boiler junction-valve. If a horizontal steam-pipe rises after it leaves the junction-valve, or if the pipe falls and then continues in a horizontal or slightly inclined direction, or if any portion of the pipe bends upwards at both ends, then accumulation of water may bring about water-hammer when steam is admitted above the water surface in a partially filled pipe or under the enclosed water. Water-hammer can be produced in pockets by the slow condensation of steam; or if a plug of water lying in a pocket is set in motion, serious harm may be done at distant parts of the steam-range. To prevent this water-hammer, all the pockets should be provided with water-catches having gauge glasses and automatic drains. Drains on steam-pipes have been the cause of about one-fifth of all water-hammer. If kept partly open, they are likely to choke; if used occasionally, they either let out the water and disturb the surface, or they are inoperative and do not remove the water as expected. Mr. Stromeyer concludes that no rules can be formulated for complicated pipe arrangements.

NEW TAR EXTRACTING APPLIANCES.

Professor F. W. Burstall's Patents.

A visit to the magnificently equipped University at Edgbaston, Birmingham, which would under any circumstances prove interesting, is at present exceptionally so to anyone engaged in the gas industry, owing to some novel apparatus that is to be seen in conjunction with the Mond gas producing plant installed in connection with the power-house there. This power-house, it may be remarked, is fitted with engines of as many types and patterns as possible, for the benefit of the students. Down one side all the steam-plant is ranged; and on the other there are a large "Premier" gas-engine, an American Westinghouse gas-engine, three petrol-gas engines, and a Diesel oil-engine. Altogether the plant must represent a good many hundred horse power; and from this portion of the University all the current, gas, and steam required are at present supplied. So far, there is no coal gas used; but a supply is contemplated from the Corporation mains, and then there will be on the premises producer gas, coal gas, and acetylene. The latter is employed for lighting only when the electricity plant is shut down. Over this portion of the University, Professor F. W. Burstall presides; and he has under him now 165 students in the Engineering Department, which is practically the full complement—almost all of them taking the four years' course which is necessary for securing their degree. Hitherto the Professor has not given any special attention to the training of men for gas-works; but this is a matter which he is of opinion will undoubtedly be taken in hand in due time.

It was amid the fascinating surroundings of the power-house that Professor Burstall was recently discovered by a representative of the "Journal" who was intent on seeing for himself just how much was being done there in the direction of extracting tar from producer gas, and the methods by which this desirable end is being secured. A hint that a battle against tar particles was being waged at Birmingham was given in the "Journal" in May last, when, in the issues for the 11th and 18th, there appeared abstracts of two patent specifications in the name of Professor Burstall. The first of these was for a gas-washer, for freeing gas from tar or dust and cooling the gas; while the second related to a centrifugal pump for the extraction of tar or dust from gases. Both abstracts were illustrated; and in view of the recent date of their publication, readers may be referred to them for a detailed description of the inventions.

The Tar-Extractor.

It is, however, mainly with the apparatus protected by the last-named patent taken out by Professor Burstall that the present article has to do. To use the inventor's own words, "this appliance is for the extraction of tar or other liquid matters from gases; and it has proved itself capable of completely removing tar from large volumes of gas. The tar-extractor consists of a casing, so arranged that the gas enters near the centre and leaves near the outside. In this casing, there rotates a shaft upon which are fastened radially a large number of steel wires. The speed of the wires is very high—nearly 10,000 feet per minute at the tips. Any small particles of tar that are carried in with the gas are, during their passage through the extractor, brought into contact with one of the wires which is already covered with a thin tar-film. The surface tension of tar being high, the tar adheres to the wires until the thickness of the film becomes great enough for the centrifugal force to throw the tar against the casing, from which it is removed by a suitable opening. It is advisable to inject a small quantity of water to assist in cleaning the wires; but the extractor can be worked dry if desirable."

The apparatus, it may be explained, originated in a curious way. When Professor Burstall started the gas-engine researches with which his name has since become so prominently connected, he discovered that the producer-gas plants were not, in fact, quite all that they were represented to be. They allowed plenty of tar to pass right through; and, as a consequence, he found himself in difficulties from the particles of this substance which had not been removed before the gas was taken to the engines. Therefore he was under the necessity of setting to work to see what means could be devised for the efficient cleaning of the large amount of gas that he required. There not being any storage at disposal, it was essential that the gas should be cleaned as it was made. Once more has "necessity" proved to be "the mother of invention;" for the urgent need of overcoming the tar trouble has resulted in the evolution of the ingenious, and at the same time extremely effective, extractor to which reference is now being made. The principle on which Professor Burstall has worked is, so far as he is able to ascertain, a novel one. At any rate, no objection has been raised by the Patent Office authorities as a result of their fifty years' search. Nothing at all like it has been found. The leading feature of the extractor is its small bulk in proportion to the amount of gas cleaned; a 24-inch wire rotor, running at 1800 revolutions per minute, being sufficient to clean 30,000 cubic feet per hour, and taking about 5-horse power. The gas, whether from a retort or a producer, is first cooled and the major portion of the tar removed. The gas then contains only very finely divided tar, which will not readily deposit; and the tar-extractor was designed to remove this fine tar by making it meet during its passage through the extractor steel wires rotating at a high speed. The wires are fixed to a ring; there being some 48 wires per ring, and the depth about a foot.

The idea of the working, as explained to the writer, and supplementing the operations described in the second paragraph, is that the gas enters in the centre of the apparatus, and has to work its way to the edge. In doing so, it is compelled to pass among a multitude of wires revolving at a high speed. It may be assumed that the tar passes through the apparatus in very finely divided particles—say, small spheres of perhaps 1-10,000th of an inch in diameter. Now, with particles so finely divided as this, the action of gravity is comparatively small—as is instanced by the manner in which dust remains suspended in the atmosphere. Tar, also, has a very high surface-tension—that is to say, if two tar globules can be forced into contact, they cannot be got apart again. The chances are, owing to the position relative to each other in

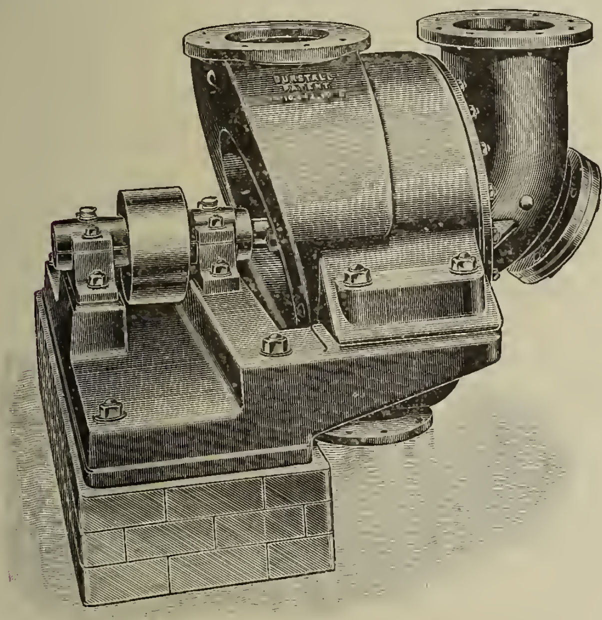


Fig. 1.—The Burstall Tar-Extractor.

which the wires are placed, that in passing through the fan every one of these finely divided particles of tar will strike one of the wires, which has already on it a thin film of tar. The two coalesce, and thus the tar slowly builds itself up until its thickness on the wire becomes sufficient for the centrifugal force to throw it off against the walls, whence it can be easily removed by simply washing. A point that cannot be too much emphasized is that the extractor is only designed to arrest the finely divided tar. It is intended that the heavy tars shall be washed out before the gas begins to be treated by this arrangement.

There is nothing in the extractor that is likely to get out of order. In fact, the one in use at the Birmingham University,

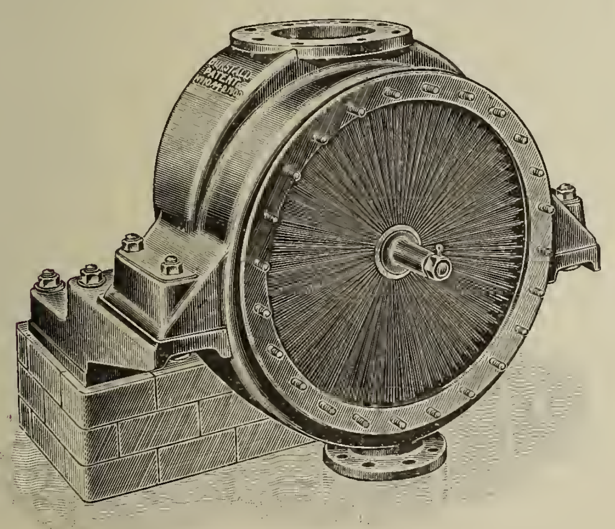


Fig. 2.—Section of the Burstall Tar-Extractor.

which is capable of passing 30,000 cubic feet of gas per hour, and is 19 inches in diameter, was put to work in December, 1907, and has since then been in operation daily from eight in the morning until six o'clock in the evening, without any renewals whatever being required. During the hours named, the whole of the make of gas is passed through the apparatus. As to its efficacy, ocular demonstration of this is amply provided by means of a comparison between streams of gas flowing from an open pipe before and after passing through the extractor. The tarry residue which falls from the apparatus is of a lightish brown colour, because the tar and the water which trickles through with it (in order to wash the tar from the apparatus down to the collecting vessel) are beaten up into an emulsion. In this condition it will remain for days. But on warming, it is found that the substance contains about 30 per cent. of moisture. While the extractor is in use, the gas does not pass at all through the sawdust scrubbers, which are otherwise a necessary adjunct to producer gas plants. Standing by the extractor for ten minutes, while about 5000 cubic feet of gas passed through it, the tar collected was seen to be quite an appreciable quantity—perhaps there was a pint of the brown emulsion in all.

The whole of this tar is a tar which is not deposited when the temperature is brought to atmosphere. It is too fine for that. And here is the key to some of the trouble that is experienced with engines working on producer gas, because normally all this tar goes into the engine. Of course, the percentage by weight is very minute; but it is quite sufficient to be highly objectionable if it gets into the pipes. Professor Burstall has not yet made a complete investigation into the character of this tar, but regards it as very deficient in valuable products. For example, he does not

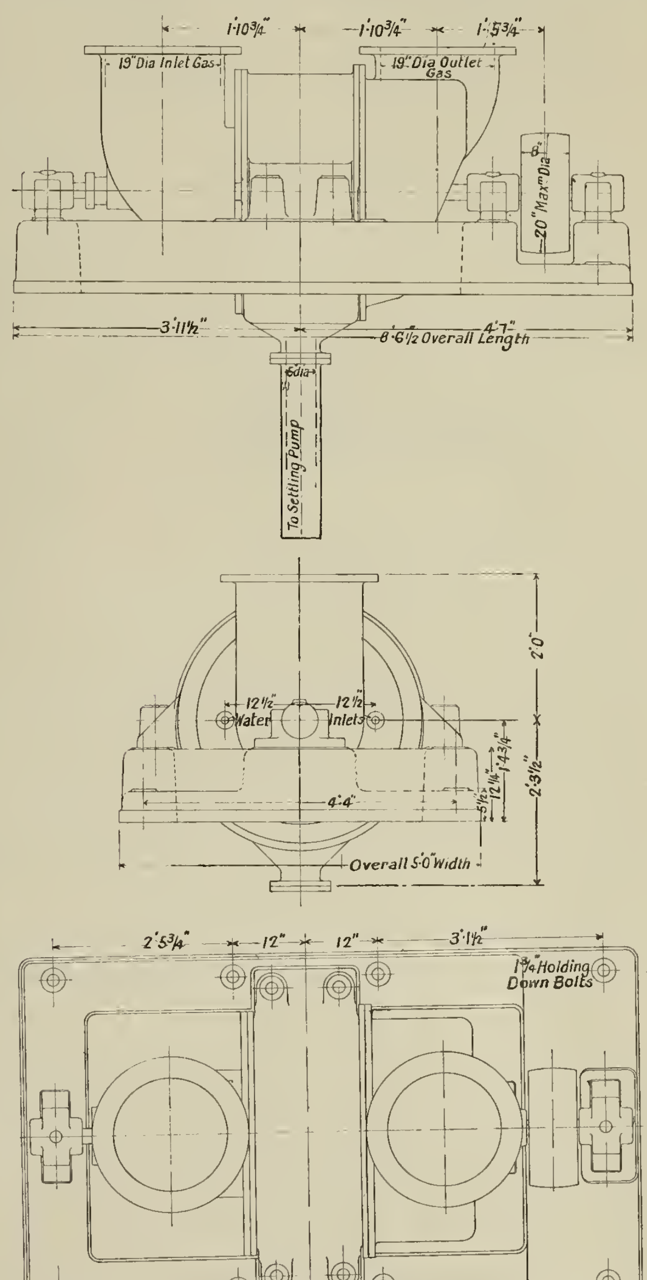
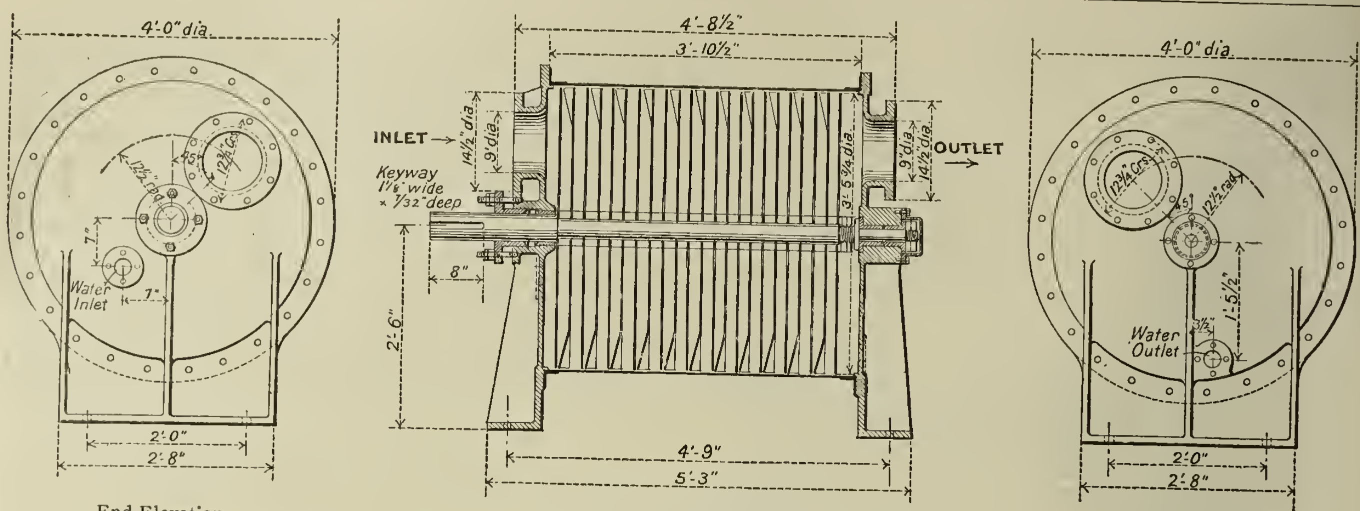


Fig. 3.—Burstall's 36-Inch Tar-Extracting Fan, to Deal with 130,000 Cubic Feet of Gas per Hour.

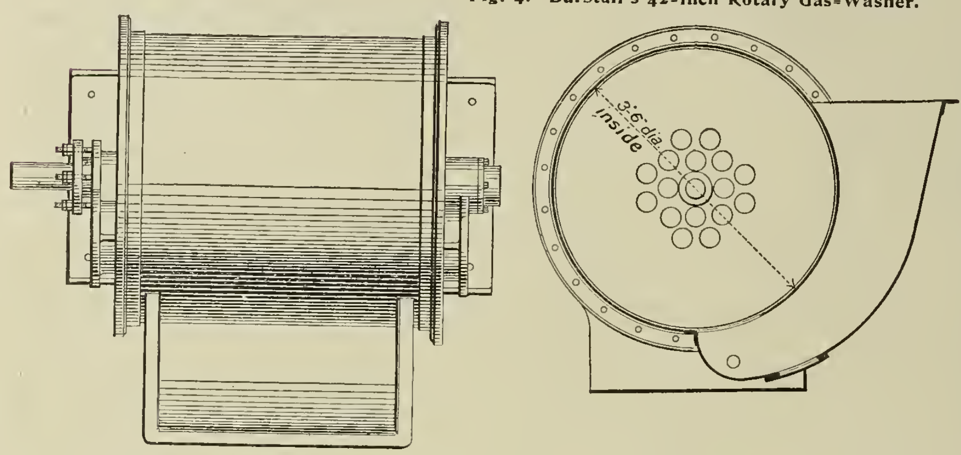
think there is any anthracene in it. He would not like to say definitely that this particular kind of tar is actually present in gas-works. In the course of the interview, the Professor produced a sample of jet black tar which had set nicely in a jar. This, he explained, had been through a sawdust scrubber and the usual cooling devices of a producer gas plant, and had travelled a considerable distance in the main. On distillation, it yielded merely an oil—one of the paraffin series—and pitch. One of these extractors was put down in connection with a coke-oven process; but it turned out that there was no tar worth mentioning to remove, so the extractor proceeded to extract oil from the gas—a light thin oil of the paraffin series. The tar had come down beforehand. This may be quoted as evidence that the extractor will take a liquid out if there happens to be one present.

Take for example a tar-extractor for 60,000 cubic feet of gas per hour. The wire brush for this is 30 inches diameter and 20 inches long. Butted wires are used, which are in this case of No. 12



End Elevation. Sectional Elevation. End Elevation.

Fig. 4.—Burstall's 42-Inch Rotary Gas-Washer.



Plan. Cross Section.

Fig. 5.—Burstall's 42-Inch Rotary Gas-Washer.

gauge; and these are drawn down, fitted into the ring, and then riveted over at the back. The steel rings in which the wires are thus fixed are mounted one after another on to a shaft, and held in position by nuts at the end. In small sizes, the wires are cast into the rings; but for bigger plants this is impracticable, because the solder into which they would be cast would not be mechanically strong enough for the work. The actual number of wires that will be included in a 30-inch extractor is 2400; and the material of which they are made is 3 per cent. nickel steel. The expense of this is not much greater than would be that of ordinary steel; and its use does away with risk of any kind.

The small amount of space occupied by the apparatus will be gathered from fig. 3, which illustrates (with dimensions) a 36-inch extractor, designed to deal with 130,000 cubic feet of gas per hour.

The Washer.

Now to come to the washer which is the subject of the other patent referred to at the beginning of this article. This consists of a cylindrical vessel in which are contained a number of discs, so perforated with holes in different positions—in one case near the centre, and in the next near the outside edge—that the gas is made to alternately pass from the centre to the circumference. These discs rotate in water; and as the tar collects on them, it is washed off, and re-appears in the catch-box attached to the vessel, from which it is removed as is required. The plates or discs are bent at the edge so as to throw the water round, because the action of the washer really depends upon a water-seal. No attempt whatever is made to get a close fit between the plates and the enclosing cylinder. The object of the machine is to collect the grosser tars and the dust. The finer particles of tar go through, as can be seen by the colour of the gas—and this in spite of the gas being quite cooled by its passage through the washer. Professor Burstall separates the tar into two groups, roughly—that which comes down when the gas is cooled, and that which does not so come down, but has to be removed either by straining or by some mechanical action. It is the second tar, in his opinion, that gives the trouble in the mains, &c., as it will travel some distance, and then settle in the valves of a gas-engine or in the small pipes of a gas-works. The washer now in action at Birmingham is an experimental one, 20 inches in diameter, and passing about 4000 cubic feet per hour. The tar removed by this is quite black, and full of dust; its appearance being different from that from the extractor, because there is no beating action.

Figs. 4 and 5 illustrate a 42-inch rotary gas-washer, according to the arrangement described.

Proposals for Using the Apparatus in Gas-Works.

Professor Burstall explained that, if he were putting an installation of his plant in a gas-works, he would have two of these washers—one running behind the other; and in them he would do his cleaning, cooling, and ammonia concentrating. Then from there he would pass the gas to two of the tar-extractors, also in series—one running behind the other. The object of having two of the extractors would be so that the second one should remove the minutest trace of tar, which it was unnecessary to remove from producer gas intended for engine work. The extractor, in addition to its tar-removing properties, being in the form of a fan, of course, acts as a "booster," putting up the pressure of the gas about 1½ inches between the inlet and the outlet. In gas-works practice, therefore, Professor Burstall is proposing to do away with the exhauster, besides the ordinary wet purifying plant, and to draw the gas through his extractor.

Another very interesting suggestion for gas-works use made by Professor Burstall was that a number of these extractors could be put one after another, and each kept at a different temperature. That is to say, there might be placed right close up to the hydraulic main an extractor with a comparatively small number of big wires in it; and this could be kept warm by covering it with an asbestos jacket. This would pick out the particular tar which happened to be soluble at that temperature. Then the gas might be passed along to another extractor kept at a different temperature, which, in its turn, would remove its own particular portion of the tar. Four or five of the extractors used in this manner one after another might effect a fractionation which is not at present secured.

While on the subject of gas-works practice, note may be made with satisfaction of the fact that Professor Burstall intends ultimately to tackle the question of the removal of the sulphur compounds from gas by washing; but as yet he has had his hands too full of other matters to give attention to this. He would like to see his way to reduce the size of the purifiers—to see if he could not take out at any rate the greater proportion of the sulphuretted hydrogen and other sulphur compounds by means of something less expensive than the present system.

An important fact to be noted in regard to both appliances is that, not only do they take up remarkably little space—quite infinitesimal as compared with the gas-works plant which they would displace—but, except for the bearings, the workmanship need not be of the best quality, so that they are very cheap things to make. What the Professor regards as absolutely essential in plant to accomplish wet purification, he claims to have attained—namely, that every particle of gas and tar shall be forced into contact with the wetted surface.

Needless to say, the Engineering Department of the Birmingham University is provided with a fully equipped laboratory; and there is to be seen here, among other things, a burner which is used, with producer gas, for heating vessels, &c. This burner consists of a piece of 1-inch pipe provided with nine slits in the uppermost portion. These slits are ⅛ inch wide; and they are situated with a distance between each of ¼ inch. There is no air admixture prior to ignition. More trouble, it may be remarked, is experienced in burning these weak gases than is often thought to be the case, because it is so easy to get incomplete combustion.

In thus reproducing the result of a lengthy chat with Professor Burstall and of a personal inspection of the plant at Birmingham University, the hope may be expressed that the article will prove as interesting to readers as did the conversation and demonstration to the writer. The extractor is doing all that is claimed for it on producer gas at the University; and particulars as to the results of its use on a retort-gas works, when available, will without doubt receive careful attention at the hands of gas engineers.

OFFICIAL TESTING OF GAS-METERS.

By Frederick Coe, of Nottingham.

From the commencement when the Sale of Gas Act, 1859, for the regulation of gas measures was put into operation, it has been considered as an imperfect measure by sellers of gas, administering authorities, and manufacturers of meters. Even inspectors of gas-meters, who are appointed to finally determine the registering state of meters submitted to them, are not agreed. Generally speaking, buyers of gas are not competent to criticize the technicalities of meter construction and gas measurement.

It is of general importance to all parties concerned that official inspectors of gas-meters should follow an adequate and uniform practice more in accordance with the whole spirit of the law regarding accuracy in the testing and stamping of meters. Such consideration would certainly call for the co-operation of gas-meter manufacturers and the administering authorities, and may-be an amended Act would be necessary. The object of the following remarks is to show, mainly from the point of view of an inspector of gas-meters, what the law imposes on inspectors. It is a remarkable fact that the greater number of inspectors follow an inadequate practice believed to be based on section 13 of the Act, and pay little regard to the equally important provisions contained in sections 11 and 12.

Experience has shown that, in many instances, the fees are not sufficient to cover the cost of ensuring accuracy of registration. The Act, as originally framed (in 1859), was an equitable measure, inasmuch as its adoption was of a compulsory nature; whereas the Act of 1860 when put into operation compelled only certain authorities to administer it, while the facilities afforded thereby were for the trading benefit of the whole gas industry, which has since become largely municipal. Official testing and stamping of meters, their manufacture, and repair, under such circumstances, are concentrated; and the inspectors appointed are comparatively few. In some instances, difficulty has in consequence arisen in dealing with the increased number of meters submitted; while the Courts have refused to receive official certificates in evidence regarding the correctness of meters that had not been tested personally by a duly-appointed inspector of gas-meters. Such personal testing of so many meters has never been really practicable. It would be more in accordance with practice were meters admitted as legal measures when they had been tested and stamped under the supervision or direction of duly appointed inspectors.

The cost of official testing and stamping of gas-meters is chargeable to the district of authorities administering the Act; and any necessary provision for the due ascertaining of the correctness or incorrectness of meters submitted, is of their responsibility. But the stamping of only such meters as had been duly tested and found to be incapable (by any means which are practically prevented in good meters) of registering incorrectly, is the responsibility of the inspectors to whom meters are submitted, under a penalty for each offence otherwise.

It is argued that all meters are not subjected to official regulation as are gas-meters. On the other hand, it has been suggested that all meters should be, as gas-meters are, subject to official regulation. Whatever value such arguments and suggestions may have, inspectors still remain liable as regards the stamping of inaccurate gas-meters. Whether all gas-meters are subject to official regulation as is provided for by section 17 of the Act, and that inspectors should seize all unstamped meters (when submitted in dispute even), is questionable, because, by a later Act (Gas-Works Clauses Amendment Act, 1871, section 13), sellers of gas thereby appear empowered to approve meters for the purposes of selling gas, provided the Sale of Gas Act's provisions have not been put into operation in the district. However, the meter's register is held as evidence of the amount passed through it (Gas-Works Clauses Amendment Act, 1871, section 20), and whenever the register of a meter is questioned, no matter if officially approved and stamped, or approved by a seller of gas and unstamped, the Sale of Gas Act is the undoubted authority regarding the accuracy of the register; and inspectors of gas-meters are the officials to finally determine the correctness or incorrectness of registration. The law does not distinguish between testing the accuracy of disputed registration and undisputed registration, although special care is observed with the testing of a meter in dispute as regards index registration. Indices are surely contrivances to register within the meaning of the law. They are certainly regarded as such in practice.

So far as incorrect registration by means of wrong indices and incorrect gear applies, it has hitherto been held with good argument that the errors found would not warrant the extra cost of detecting them. However accurate this statement may once have been, not at any time have all meters been so tested. The real extent of the errors through wrong and inaccurate indices, or wrong transmitting gear in meters, can never have been known. Such errors, when found, have been shown to be most serious, and some have remained for a number of years undetected.

The President of the Board of Trade seemed to have been so satisfied with the Act's provisions regarding index-testing that he was enabled to declare that, notwithstanding the absence of specified methods as to how to do it, the law provided for correct registration in meters within certain limits. (*Vide* "Journal," April 3, 1906). It would therefore be presumptuous if inspectors, in the absence of Board of Trade regulations, were to place any other construction on the Act's provisions regarding their responsibility. The sparsely specified methods contained in the Act's provisions, to be observed by inspectors in the testing of meters under the Act, permits of an inspector's judgment being exercised as to what method he may employ for the purpose of ascertaining the correctness of a meter before being compelled to stamp it and render himself liable to a penalty should he stamp it without first having duly tested it and found it incapable of registering incorrectly by any means which are practically prevented in a good meter. Whether the methods employed are questionable or not, should any party be dissatisfied with an inspector's decision, he is obliged to state the reason of his decision in writing to the party dissatisfied, if required to do so. In other words, the Act has not appeared to have presumed finality as regards the means by which gas may be measured commercially.

The real consideration of testing the actual registration in meters has, undoubtedly, been a question of cost. Inspectors are therefore compelled by their responsibility and their liability to seriously face this question of cost which compels them to stamp meters without duly testing them. There is no real need to incur a cost that could be considered prohibitive. By a simple re-arrangement in the manufacture of new indices, the correctness of the index and the transmitting gear, as affecting registration in a meter at the time of stamping, could be officially guaranteed, and this with the usual dispatch, and with meters submitted finished as heretofore—providing their indices were submitted previously for examination and stamping, so as to be identified in finished meters. Such indices could be readily examined by hand, and stamped for an extra fee not exceeding 3d. each index—probably 2d. each where the complete action did not exceed 100,000 cubic feet. To require this with all new meters submitted would not disorganize the present system of business, and would not cost more than a small additional fee. Certainly not a fee that could be considered prohibitive. This would call for co-operation by manufacturers of meters and authorities administering the Act, but not necessarily an amended Act.

There are, however, various other means by which inaccurate registration does result that the usual method of testing does not discover, other than by inaccurate or wrong indices or wrong gear in meters. Meters are stamped as registering correctly at fixed rates of working; and they may be seriously inaccurate at other rates of working and vary in registration as much as 20 per cent. By applying the provisions contained in section 12 of the Act, the stamping of such meters would be prevented, because there are good meters with means that prevent inaccurate registration at various rates of working. But owing to the provisions of section 13, fixing the rate at which meters shall be tested for percentage of error, such inaccurate registration, in dry meters, can only be officially prevented by a working arrangement between inspectors and senders of meters.

With certain wet meters, extended water-ranges may result in inaccurate registration when the meters are worked at the exceedingly high rates which extended water-ranges are provided to permit. It then becomes questionable if such meters should be stamped, unless they had been subjected to testing at low-water line and found to be incapable of registering incorrectly by abstraction of water, notwithstanding that they were compensators, because were all such meters found to be incapable of registering incorrectly by abstraction of water, incorrect registration at exceedingly high rates of working would not result, but in many instances their capacity per hour would be limited to little more than their badged amount.

Were all wet compensating meters required to pass an increased speed-test at normal water-line, the low water-line test might be omitted, because loss of water is provided against in some meters by compensation, and incorrect registration through loss of water is prevented in others. This is of serious consideration to inspectors of gas-meters, sellers of gas, and buyers of gas, because wet compensating meters may register either very fast or else pass unregistered gas to a considerable extent at increased rates of working, even though registration is correct at the prescribed normal rates, and even until the float falls and the supply is closed by abstraction of water.

There is provision against the using of meters at rates beyond their badged amounts per hour; but it is not really acted up to. It is admitted that meters are fixed to pass any amount, from a small pilot light up to as much as can be got through them.

With meters of large capacity per hour, inspectors have perforce to test them at rates much below their badged amounts, and maybe that, when in use and working at their normal rates, registration (with dry meters) would be seriously incorrect. With good meters this would not be the case. Inspectors should bear these facts in mind before stamping meters of large capacity per hour. What the registration state of meters would be at their normal rate per hour, and the pressure prescribed, may, in many instances, be ascertained by increasing the pressure until the normal rate per hour is attained. With meters the badged capacity per hour of which is not attainable by increasing the pressure, correctness of registration can be ascertained by comparative tests at rates lower than the badged capacity per hour. Dry meters that register comparatively correct at reduced rates, do not usually vary in registration at higher rates of working, and good meters will not do so beyond the limits for error permissible. These may well be matters of arrangement between

inspectors of gas-meters and the senders of meters, so long as the law holds as to the testing of meters for percentage of error at fixed rates.

Difference of pressure does not materially affect the register of meters at fixed rates of flow—probably not more than ½ per cent., while increase of pressure may not affect registration at different rates of flow. Although it has been admitted with the selling of gas at exceptionally high pressures that increase of pressure does not affect the register of a meter, registration may be affected at different rates due to increase of pressure. Registration may or may not vary when the internal resistance in a meter varies. The internal resistance in a meter will vary if the rate of flow through it is varied. Probably the greater number of gas-meters do not vary in registration at different rates of flow beyond the limits for error prescribed; while, maybe, very few would so register correctly were the limits of error reduced. Where it is considered that a reduction of the present permissible error is desirable, this would appear well worthy of consideration. Meters may register quite accurately at fixed rates of working, and yet be capable of registering considerably in error at other rates of working. Some are of opinion that the official testing of gas-meters at a pressure that will balance a column of water half-an-inch high is useless, unnecessary, and unreliable, in view of the fact that the service conditions are different from formerly. It must, however, be quite clear that meters approved under the prescribed pressure must needs be of good finish, work smoothly, and be of large thoroughfare. These are essential features in all good meters.

It is fairly generally believed, and considered as acted up to, that the law provides for the testing only of the measuring chambers of meters. To do this it is necessary that the tangents in dry meters, and the measuring wheels in wet meters, should be observed. In neither case has this ever been practicable with meters as submitted for verification. Inspectors have not demanded that such facilities shall be provided. Such facilities as those provided for the purpose of official verification, and which are generally held as sufficient, neither ensure the accuracy of the measuring-chambers, as compared with the markings per revolution, nor the correctness of the index registration, which the law holds to be the register. The markings required by law to be put on all meters submitted for official testing and stamping are minutely stated, and are recorded by inspectors in their minutes of testings; but they do not appeared to have answered any generally useful purpose in verification. They do, however, form the basis of the charge for verification; while the charges are not affected by any markings of less amounts than one cubic foot beyond the first cubic foot.

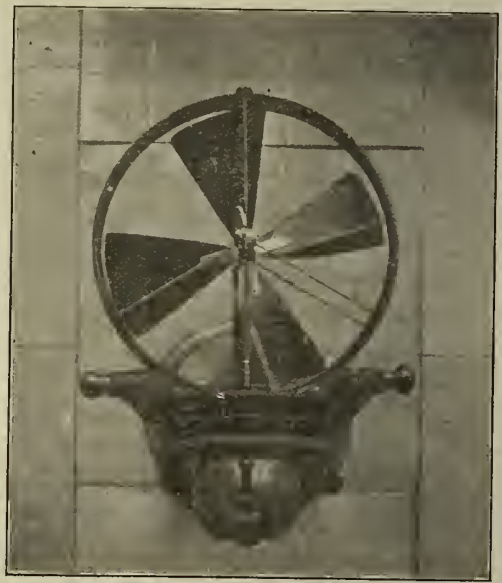
Sellers of gas are of opinion that sufficient attention has not been directed towards the passing of unregistered gas apart from slow registration. It is claimed, and it does appear rightly so, that serious losses result as a consequence (*vide* "JOURNAL" for July 9, 1907, p. 93). Certain it is that no satisfactory registration state can be ascertained with an unsound meter. Even were the small amount of ½ cubic foot per hour to pass unregistered (the minimum amount prohibited by the Act), serious loss may result to the seller of gas. Registration would vary at different rates of working until, when working such an unsound meter at a rate of 2 cubic feet per hour (which is equal to the supply of a modern burner), the error would be not less than 20 per cent., although registration was correct at the normal rate of the meter. It might be said that, were it so, the gas unaccounted for would be enormous. But registration losses are not always against sellers of gas. It would thereby appear that one very largely balances the other; while buyers, as individuals, may gain or lose.

To observe that a meter registers the minimum amount prohibited by the Act to pass unregistered, and that it does so throughout one revolution of its measuring chambers, would in some instances seriously delay the work of a testing-station. The letter of the Act prescribes that meters found to work under the conditions prescribed shall be deemed sound meters. They may be so legally; but actually they may not. It is of much importance that meters should register the minimum prescribed throughout one revolution whenever that is practicable; and unless sufficient provision is made for dealing with large consignments of meters, considerable delay must arise in so dealing with all, or even a portion, of the meters that are submitted at many places. There are, however, means by which meters could be so tested with dispatch.

Were these various points seriously considered by inspectors, administering authorities, and manufacturers of meters, it might be that eventually some generally uniform and satisfactory system would be established.

BROCKWAY-PHILLIPS GAS VENTILATING FAN.

ON the occasion of the meeting of the Eastern Counties Gas Managers' Association last week, the members were afforded an opportunity of inspecting, in the show-rooms of the British Gaslight Company, a gas-driven ventilating fan designed by Mr. E. J. Brockway, of Cleethorpes, and manufactured by Messrs. Harper Phillips and Co., Limited, of Grimsby, who are the licensees for the sale of the appliance. The fan, which is shown in the accompanying illustration, is operated with ordinary gas, and it can be instantaneously connected with the service-pipe by means of a small flexible tube. The power is furnished by a completely enclosed bunsen burner; and the speed of the fan is regulated by a tap. It can be set at any desired angle—even at right angles to a wall—and be started at once. The fan will be found specially suitable for ventilating houses, hotels, billiard-rooms, workshops, bottling stores, and wherever free circulation of air is necessary. It is specially serviceable in preventing steaming on shop windows. It is claimed for the fan that it is free from smell, that no noise or danger attends its working, that it has no complicated mechanism, does not require attention, and will run for 24 hours at the cost of 1d., or about one-eighth the working cost of an electrical fan.



A Gas-Driven Ventilating Fan.

The history of the fan is rather interesting. It appears that the proprietor of a large local hotel, lighted throughout with gas, called upon Mr. Brockway some months ago and inquired if he could do anything to ventilate his smoke-room and billiard-room, as the electrical people had, he said, been worrying him to put in electrical fans. Mr. Brockway at once saw the danger of losing a good consumer; and having been recently experimenting with hot-air engines for a small power purpose, the idea struck him that this principle might be applied to fans. Experiments were made in his own shops, and found to be successful, with the result that the fan was patented in conjunction with Messrs. Phillips. Only a few have been made up to the present; but we are informed that they are giving complete satisfaction, and that an order has just been received, after trial, for the fitting up of a number, as shown in the illustration, in underground lavatories and for bottling stores.

THE "DARWIN" BURNER.

THE patents relating to the well-known "Darwin" inverted incandescent burner were purchased in the spring of this year by Messrs. Charles Joyner and Co., of Icknield Square, Birmingham, who have since then devoted a very large amount of time and thought to the remodelling of the burners, and claim now to be turning out a far superior article to anything that has been produced before. They have dispensed with the three-prong iron mantle-carrier, which they found tended to damage the mantles when being fitted, and are now supplying a high-class clay nozzle, with ears on, designed to carry the mantle. The protector plate is made of best tinned steel, and completely covers the brass parts exposed to the flame, thereby keeping the burner free from any deposit. Two novelties have been introduced this year—namely, the medium-size burner, No. 2, which is finding a very ready sale, and the No. 7, which is an enclosed burner in an enamelled iron casing.

The No. 2 "Darwin."

A test of a No. 3 burner, taking an ordinary sized mantle, showed that, with a consumption of 3·55 cubic feet of gas per hour, at a pressure of 15-10ths, the illuminating power was 122·76 candles, or 34·58 candles per foot. Another test of a No. 5 burner, taking a bijou mantle, gave, with a consumption of 1·25 cubic feet of gas per hour, at 17-10ths, 52-candle power, or 40 candles per foot.

The burners are made entirely in the firm's own works; and all parts are interchangeable, so that replacements can be readily made.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

Autumn Meeting in Hull.

The Autumn Meeting of the Association was held at Hull last Thursday. Though the noted seaport is situated at the very northern extremity of the district, the members were attracted in considerable numbers, which must be attributed as much to the magnetic personality of the President (Mr. John Young) as to any other influence. The day's programme commenced with a luncheon at the Royal Station Hotel, on the invitation of the Chairman and Directors of the British Gaslight Company, whose Hull works are under the management of Mr. Young. Unfortunately, only one representative of the Board was able to be present—that was, General W. T. Corrie. But he was a worthy and genial representative of a Board who thoroughly recognize the value of technical organization in the gas industry; and his affability throughout the luncheon and subsequent proceedings effectually swept away any regrets that the members and visitors may have felt at not seeing other members of the directorate present whose names are as household words in the technical, commercial, and administrative departments of the gas industry's work. Supporting General Corrie were the Mayor of Hull (Mr. H. Feldman), the Sheriff (Dr. Gautby), Mr. C. F. Ruggles, the outgoing President of the Association; Mr. John Young, the incoming President; Mr. Thomas Glover, Ex-President of the Institution, and Engineer and Manager of the Norwich station of the British Gaslight Company; Mr. A. W. Brookes, the Secretary of the British Company; Mr. A. Allan, Assistant-Engineer at Hull; Mr. W. Lovatt, Chief Clerk; Mr. J. R. Warren, District Superintendent; Mr. G. Perkins, Show-Room Manager; Mr. J. J. Runton, the Chairman of the East Hull Gas Company; Mr. J. Holliday, Engineer and Manager of the East Hull Company; Mr. D. Wood, Secretary; Mr. C. B. Newton, the Corporation Gas and Water Engineer; Mr. E. Laverack, Town Clerk; Mr. A. E. White, City Engineer; Mr. H. Bell, Corporation Electrical Engineer. Other guests included the President of the Midland Association (Mr. W. Langford), Mr. W. H. Thrale, the Secretary and Manager of the Hessle Gas Company; and Herr Albert Schmidt, representative of Herr Feld.

Before luncheon was served,

General Corrie remarked that he was present as one of the Directors of the British Gaslight Company; and he was sorry he was the only one who could conveniently be there. However, in the name of the Board, he welcomed the members to Hull, and to those who were not strangers, and were resident in Hull, he gave hearty welcome to the luncheon. Those connected with the Gas Company were all delighted to see their guests; and he hoped the visit would be a pleasant one. He felt sure it would be so; for his friend, Mr. Young, was so popular with everybody, including the Directors. In the name of the Chairman and Directors of the Company, he bid all a hearty welcome.

Mr. Young (after luncheon) said he felt the members of the Association would feel there was some blame attaching to him if he omitted to take this opportunity of thanking his Worship the Mayor and the Sheriff for being present that day. When he (Mr. Young) took charge of the British Gaslight Company's works at Hull, his predecessor was in such a state of health that he was unable to do much in the way of introducing him; but he (Mr. Young) soon found that his predecessor's sterling qualities and fine business instincts had prepared the way for a kindly reception to his successor, and especially did he find this when he had to meet any of the city authorities. Every scheme that he had to advance, every business transaction, every negotiation there had been between the Corporation and themselves (and he thought he might speak here for the East Hull Gas Company, as well as for the British Company) had been considered with the greatest fairness by the business men in the governing body, and with a kindness and courtesy that no words of his could thoroughly and properly express. It was a great thing for a city to have men of fine business instinct who were willing to give up their time, ability, and energy to the good government of the city. Hull was particularly blessed in this regard. His Worship the Mayor had devoted many years to the service of the city, and for the last three years had occupied the principal and most honoured position the citizens could bestow upon him. The Sheriff (Dr. Gautby) was second to none in working for the city's progress. Unfortunately, there were a lot of people in Hull who were ever decrying their city, and saying that things were done better elsewhere. He (Mr. Young) went to school in Hull; he began business there; and so he knew something of the city, and had a warm heart for it. He would say to all those pessimistic people—take example by the civic rulers, especially his Worship the Mayor and the Sheriff. They never decried the city, but they gloried in its progress; and it was the duty of each one of the citizens to endeavour to enlarge and magnify it in the eyes of the nation. He ventured to give the toast of the Mayor and Sheriff.

The Mayor, in his response, said it was a privilege to extend a cordial welcome to the gas experts of the eastern counties. They were gentlemen who practically advised as to the best methods whereby the consumer could be properly and adequately safeguarded, and obtain from gas the greatest efficiency. He was glad to learn that Mr. Young entertained such a good opinion of Hull. During the last few years the, Corporation had done all in their power to obtain the good opinion of visitors to Hull. In his view, the more advanced municipalities were the better for the people, and for the suppliers of such necessaries as gas, because the more a city or town was improved, the more essential became improved and additional gas lighting. Nothing to his mind was better in making a good impression than to have an adequate supply of gas—particularly on the terraces. In this connection, he took the opportunity of tendering a compliment to the British Company and the East Hull Company for their ready assistance and help in connection with a scheme for adequately lighting the terraces of the city. On every occasion that the Corporation had had to deal with the British Company, they had always been met in a fair and reasonable spirit. He took it that it was the policy of gas companies in a large city like Hull to work in harmony with the municipality. It was to their mutual advantage; and he did hope the good feeling that had existed so long would be continued, as he was sure it would be while the British Gas Company was so well managed as it was that day. He was delighted to meet General Corrie. He was a man who had had a wide experience, and had been engaged very largely in the defence of the honour of his country. Their Chairman knew how necessary, from his experience, it was to use tact and judgment not only in military matters, but in the management of concerns like the one with which he was now associated. He proposed General Corrie's health.

The Sheriff, in his response to Mr. Young's toast, directed his remarks to the question of competition, which he thought had been of as much advantage to gas as it was to individuals. It helped to bring out the better side and the resources of people more than ease and monopolies.

General Corrie, responding to the toast of his health, endorsed what had been said by his Worship the Mayor and the Sheriff as to the position and utility of the gas industry, which still made strides, though it had to meet the competition of the electric light. The gas industry would never sink simply because the electric light was useful.

Mr. Ruggles said the members of the Association could not leave the festive board without passing a hearty vote of thanks to the Chairman and Directors of the British Gaslight Company for their kind hospitality. They had treated their visitors handsomely—not only by the luncheon itself, but by the way in which the representatives of the Company had rallied round them. Those present who were fortunate enough to attend the excursion of the Institution to Norwich in June would understand the way the Board of the British Gaslight Company regarded the members of the gas profession. They had had further evidence of this that day.

The words of the President were heartily endorsed.

General Corrie said he thought it was a sort of "practical joke" getting him on his legs again, when he had been told by Mr. Young that there were to be no speeches, and when he was not such a speechmaker as other members of his Board, whose absence he particularly had reason to regret. However, on behalf of the Chairman and his other colleagues, he thanked the members for their vote, assuring them that the Board had always at heart the welfare of those who laboured in the gas industry.

Business Meeting.

The Business Meeting was shortly afterwards held in another room in the hotel. The retiring President (Mr. C. F. Ruggles, of Leighton Buzzard) occupied the chair at the opening of the proceedings.

The Hon. Secretary (Mr. T. A. Guyatt, of Ely) read the minutes of the spring meeting held at Stamford; and they were confirmed.

Additions to the Roll.

The following nominations for membership were submitted: Mr. Peter Mason, of Kibworth Beauchamp; Mr. William H. Archer, of Cromer; and Mr. John Andrews, of Langley Mill, Notts. As associate: Mr. T. N. Ritson, of London.

Mr. W. J. Carpenter (Yarmouth) proposed that these gentlemen be elected; and he suggested that the new members who were managers of works should be prevailed upon to join the Commercial Sections.

Mr. G. R. Casterton (Melton Mowbray) seconded the motion, which was unanimously adopted.

District Member of Gas Institution Council.

The President said he had much pleasure in proposing that Mr. John Young, their new President, should be appointed district member of the Council of the Gas Institution. Mr. Young had been on the Council for three years; and it would, he was sure, give him pleasure to continue in office another year.

Mr. F. Paternoster seconded the motion; and it was unanimously carried.

The New President and the Old.

The President said the next item on the programme, the members would be delighted to know, was that of asking Mr. John Young to take the presidency of the Association during the ensuing twelve months. Mr. Young was so well known to the members—in fact, to the gas profession generally—that no words were needed from him by way of introduction. They were all pleased to have been able to secure the services of such an excellent man to fill the post of President; and he (Mr. Ruggles) was positive that, at the end of Mr. Young's year of office, each member would agree that he had benefited from his knowledge, experience, and ability. He had much pleasure in asking Mr. Young to take the chair.

Mr. Young said his first duty was an exceedingly pleasant one; and it was to propose a hearty vote of thanks to the retiring President for his excellent services during his year of office. Mr. Ruggles had been the successor of many worthy men who had struggled hard at the inception of the Association for, and had carried it through to, the great measure of success it enjoyed that day; and he had been a most worthy successor. He had upheld

the traditions of the Association; and, under his able guidance, it had prospered exceedingly. He (the President) was only expressing the feelings of the members in proposing this vote.

Mr. J. Davis (Gravesend) said it gave him great pleasure to second the resolution. During the past twelve months, they had seen a great deal of Mr. Ruggles; and he was sure he was only expressing the views of the members generally when he said they had never had such a genial President before.

The motion was heartily carried.

The President's Medal.

The President remarked that it became doubly interesting to him, having heard the expression of the good feeling of the members towards Mr. Ruggles, to present to him the President's Medal of the Association. He trusted Mr. Ruggles would long be spared to wear it; and that every time he looked upon it, he would think of the respect and the affection that were entertained for him by all who knew him.

Mr. Ruggles, in reply, said that words failed him to express his gratitude for the handsome present that had been voted to him, and for the kind words that had been used concerning himself. He felt he did not deserve them. When he took the chair twelve months ago, he did so with fear and trembling; but he regretted now, after the many kindnesses he had received at the hands of the Committee and of the members generally, that his year of office had expired.

The President then delivered the following

INAUGURAL ADDRESS.

I must again thank you for the honourable position in which you have placed me, and assure you that I shall endeavour to carry out the duties of the office to the best of my ability. The members of the Association have always given such loyal support to their Presidents that I have every confidence that my shortcomings will be pardoned; and with your kindly assistance I hope my year of office will be one of continued progress.

AN INJUDICIOUS ACT.

We have now had an opportunity of judging the probable effects of the Eight Hours Act; and as coal is the main factor in our success, as it is also the foundation upon which rests the prosperity of all other industries, I make no apology for reviewing the situation from my point of view. The date of the introduction of the Eight Hours Bill was well chosen by the representatives of the Miners' Unions. The colliery owners, by united action, had raised the price of coal to a figure which could not possibly be maintained for any great length of time; and the men's representatives, being in a position to put pressure on the Government, seized the opportunity to induce the Home Secretary to introduce the Bill, hoping, no doubt, that it would become law at about the time when the owners' combination was sufficiently weakened to produce a falling price in the coal market. They could then very justly point out that the price of coal under the new Act was less than in the previous year, and no doubt hoped to claim that it had been beneficial to the community at large. Deputation after deputation waited upon the Home Secretary—deputations consisting of the ablest business men, representing every industry. They were received by the Home Secretary with the unfailing courtesy characteristic of him. He admitted that if the Act resulted in any permanent increase in the price of coal it would be a very serious matter for the country at large; but, with a smile of pity for the short-sightedness and selfishness of those who only looked at this question in so far as it affected (or appeared to them likely to affect) their own immediate interests, he gently hinted that all were mistaken—that the Act could not, and would not, affect any user of coal, except in a beneficial manner.

What are the actual facts? During May, June, and July the whole country was in an unsettled state, owing to the action of the colliers, on the Bill becoming law. Not satisfied with an Act defining the limit of the hours of labour, one section of the Miners' Union demanded a readjustment of the minimum wage. As a consequence of this, we were threatened with a general strike throughout the whole country; and trade, which appeared to be showing slight signs of revival, again became unsettled and depressed. Although, fortunately, a general strike was averted by the concessions of the owners (we do not hear of the men conceding anything), what is the effect of the Act on the collieries now working? We hear of reductions in the output of 10 to 16 per cent. per man. This must mean a permanent enhancement of the price of coal; and the cost of production of every article manufactured in this country must, therefore, be increased. Now, it is in the markets of the world that these goods have to compete in price with similar goods manufactured in countries under quite different conditions. Even before the introduction of the Bill, our manufacturers found it difficult to retain their trade; and if the cost of production is still further increased, how can they hope to hold their own? Any loss of trade by our manufacturers re-acts on the whole country; and we, as suppliers of artificial light, will suffer as they suffer. So that not only shall we have to pay an increased price for our raw material and all manufactured articles we purchase, but we are liable, also, to suffer a diminution in demand for our finished product, owing to the far-reaching and pernicious effects of this Act.

BYE-PRODUCTS OUTLOOK.

The question of the price of coal naturally leads to a discussion of the probable future of our bye-products markets. Coke is at present our most important residual, and, in my opinion, the outlook is hopeful. It is true that the production of coke is increasing yearly; but the demand, so far, has easily kept pace with the production. In their own particular field, gas engineers are paying much more attention to the cultivation of a local coke trade—they are endeavouring to ascertain the requirements of their particular localities; and they are also educating the public to the advantages of using a smokeless fuel and in the method of attaining the best results from the fuel used.

The sulphate of ammonia market has kept fairly even during the last few years, and, in spite of the largely increasing production—not only from gas-works, but from coke-oven recovery plants, both in this country and abroad—the demand is ever increasing. Also, new fields are being opened up—notably in the Far East; and the outlook is distinctly hopeful.

With tar products, however, I am afraid we cannot have the same hopeful feeling. So long as the demand for any article is maintained at a level equal to the production, an even market can be expected. But should the production exceed the demand by a very narrow margin, the fall in value of the total production is out of all proportion to the small surplus which has caused the slump. The normal increase of tar production at gas-works would probably not affect the market to any extent; but the greatly increased production arising from coke-oven recovery plants will probably have a serious effect on the tar products markets in the near future. Many of these coking plants have been erected to produce coke from coal dust at collieries where the dust was formerly made into briquettes; so that they have not only become tar products producers, but have ceased to be tar products consumers. Every effort must be made to find new outlets for our tar. Something has been done in the matter of road surface treatment, and something in the renewal of the practice of making coal-tar macadam roads. But these are comparatively small outlets for a raw material which, consisting, as it does, of rich hydrocarbons, ought to be of greater value to the manufacturing world than to be buried in road-making in its raw state. Something, also, has been done in substituting benzol for lighter spirit as a source of motive power in spirit motor engines; and it is to be hoped that further progress will be made in this direction.

The demand for creosote, fortunately, is still slightly in excess of the production; and pitch has increased in value recently. But, unless some new market is created, it is difficult to look on the increasing production without grave fears for the future.

A SURVEY OF THE CARBONIZING FIELD.

Our ideas on the subject of carbonization are undergoing complete transformation. Until quite recently, a thin layer of coal gasified in the least possible duration of time was considered to be the acme of perfection for obtaining the best possible results, not only from the coal, but also from the floor-space of the retort used—in other words, for the amount of capital employed, and also the cost of labour involved. As long ago as 1896, an installation of coking-ovens was erected in Halifax (Nova Scotia) for the purpose of carbonizing coal in bulk, and supplying therefrom illuminating gas for the lighting of the town. This was followed by installations at Boston and other places in the States. But it was found that it was possible to utilize for illuminating purposes the gas produced during a comparatively small proportion of the period necessary for complete carbonization of the whole charge. Those who have studied the curves obtained by Professor Bunte, showing the illuminating power of the gas produced at various stages of a charge undergoing carbonization for twenty-four hours, will readily understand that this must be so. The curve shows that, for a few minutes in the first hour, the gas attains its highest value—being at the end of the second hour only a little more than half the value, while at the end of the fourth hour it is little more than one-third, and during the last nine hours there is a sharp curve from this point to nil.

Our Continental brethren, in the meantime, directed their attention to the vertical retort; and they have succeeded in evolving a very fine gas-producing and coke-making plant—obtaining their results with the minimum expenditure of labour. The coke that results from the vertical retorts on the Continent is excellent in quality, and a good yield of gas per ton is obtained; but the illuminating power is only from 10 to 12 candles, tested by the "Metropolitan" No. 2 burner. The calorific value, however, is higher than one would expect, and is sufficient to satisfy the requirements of supply demanded from our Continental friends. We have not yet, in England, arrived at the point where illuminating power can be ignored, and calorific value only be considered. This fact has led to many other experiments in coal carbonization. Continuous carbonization in vertical retorts has been the aim of those indefatigable workers, Messrs. Woodall and Duckham; and there is no doubt they have overcome the mechanical difficulties of such a process, and have achieved success. Messrs. Glover and West, following on similar lines, have also scored a success in the continuously charged vertical retort; and, reviewed in the light of our old experience of carbonization, it seems theoretically correct that a continuously moving charge passing through the carbonizing vessel in a comparatively short period of time—say from seven to nine hours—would be more likely to produce a gas of even illuminating power and of a sufficiently high quality, than a similar quantity of coal charged into a vessel and allowed to stew for twelve or even twenty-four hours.

Here, however, another surprise awaits us. From various parts

of the country we have reports of experiments where retorts—vertical, horizontal, and inclined—filled quite full of coal and allowed to carbonize for a lengthened period—have given results in which every product is increased in value. The yield of gas is largely increased without any diminution of illuminating power; the coke is of a better quality and there is more of it; the yield of tar is greater and the quality much better; the sulphate of ammonia produced is also increased; and sulphur compounds and naphthalene are also eliminated. After reading the reports of these results, there can be little wonder that any engineer contemplating the erection of new carbonizing plant hesitates to adopt even the very latest development in that field. He may well wonder where all the leakage could have taken place in his existing plant when he reads of the large all-round gains claimed for admittedly experimental plant, and speculates as to whether perfected apparatus will give still further advantages. I may, perhaps, be permitted to remind you that our Continental friends, with their fine installations of vertical retorts, do not claim to have obtained the great results enumerated above—especially with respect to illuminating power. The illuminating power of gas is still the legal standard of its value in England; and the cost of producing gas of such illuminating power as will conform to our legal requirements must still be the criterion of the success, or otherwise, of any process of gas manufacture.

AMERICAN CARBONIZING PRACTICE UP-TO-DATE.

In the United States our brethren are also working on the carbonizing problem. In a works having a large installation of inclined retorts, each retort being 20 feet by 26 inches by 15 inches, their practice for a considerable time has been to fill the retorts quite full, and raise the temperature so that the charge is thoroughly carbonized in six hours. The temperature in the combustion chamber is maintained at 2500° Fahr., giving an average of about 2000° Fahr. in the retorts.

Our American friends supply a gas of much higher illuminating power than we do—from 20 to 22 candles being the usual standard. The results at the works here quoted are 11,580 cubic feet per ton, of 17·19 candles; and the coke, tar, and sulphate are not appreciably affected. The yield of gas is 20,500 cubic feet per retort per day; and the make per man per day is 132,000 cubic feet. This latter figure includes foremen, stokers, firemen, scurfers, and quenchers—in other words, the whole of the labour from the coal hopper to the coke conveyor. In another works, horizontal retorts have been constructed consisting of pure silica material. These retorts are built up of segmental tiles, very similar to those used so successfully by Mr. Hack at Birmingham. These retorts are 15 feet long by 26 inches by 16 inches; and they are charged and discharged at one operation. The scoop containing the charge acts as a discharging ram, and is so constructed that it leaves almost a full charge in the retort. The space left unfilled is only about 3 inches from the top of the retort. Experiments were made to ascertain the temperature and duration of charge which would give the best results; and it was finally decided that these were obtained when a temperature of 2000° Fahr. was maintained, and the charge allowed to remain in the retort for seven hours. Under these conditions they produced 12,118 cubic feet of gas per ton, of 16·2 candles, tested by the "London" No. 1 argand. This is claimed to be a considerable advantage over their former practice with the same coal. It appears in both cases that the increased yield of gas results in a decreased illuminating power; but the decrease in illuminating power is not in the same ratio as the increase in yield per ton, so that, calculated in candle-feet per ton, there is a distinct gain.

SYSTEM IN STUDY AND WORK.

With these and other problems facing us, it is fortunate that those who are now training to follow us as engineers have the advantage of obtaining thoroughly technical education before applying themselves to the exclusive and serious study of their own profession. Whatever the scholastic attainments of any young aspirant, let me most earnestly suggest that at least one year's training should be taken in the engineer's fitting shop at a gas-works. I do not know of any better method of obtaining a full insight into the construction of every part of the appliances than to have to assist in the repairing of them. It gives a practical grip of detail which I do not think can be obtained in any other manner; and, above all, it ought to teach the young engineer what manner of men he hopes some day to manage. It will show him their strength and also their weakness; it will help him to admire the one and give him the desire to improve the other; and, above all, it ought to teach him how easy it is to work with the men instead of against them, as so many beginners are inclined to do. This will help him on to a solution of any labour difficulties which may arise. The initial success of the profit-sharing scheme at the South Metropolitan Gas Company was due, I am sure, quite as much to Sir George Livesey's keen interest in all that pertained to the true well-being of his men, and their knowledge of that fact, as to the promise of benefits likely to accrue to the men, of which, in the beginning, they could only have had a hazy and indistinct idea.

While on the subject of the training of a gas engineer, let me also impress upon the pupil the value of system. The daily task is a most important one. Let every day carry its own burden—the putting off even of small things results very quickly in an intolerable burden; and let him make every part of his duty a daily one, as far as possible. It is too late at the end of a month to make the discovery that a discrepancy has taken place—the damage is already done. But by systematic and daily routine, these leakages and discrepancies can be detected and rectified at once. This applies quite as much to the commercial side of our work as to the engineering. Let me give an example of system as applied to the commercial side of our responsibilities—viz., the collection of accounts. It is quite as important to collect all the money earned as it is to earn it. The total area of supply is divided into districts, and each district is again subdivided, corresponding to divisions in the meter-reading books. The reading of meters is begun on the twenty-fourth day of each third month and finished on the seventh of the succeeding month. As each reading-book is finished, it is seized upon by the collector, who transfers the indices to his collecting book, which consists of bill, receipt, and counterfoil. While recording the index of the meter, he calculates the charge and makes out the bill. The reading-book is handed to the rental-clerk, who makes the charge in the rental book; and then the collector's book and the rentals are checked the one by the other. On the first day in each quarter, the collector begins delivering bills; and if he does not receive payment, he stamps on the bill a notification that his second call will be made upon a certain date. The whole of his first round is completed before the end of the first month of the quarter. The second round is then begun and finished, after which the collector has ample time to send out various notices to the laggards. As the quarter lengthens, the notices increase in urgency, until, finally, a few summonses wind up the quarter. In the meanwhile, the collector has time to prepare his collecting books for the next quarter. I do not think there is anything very exceptional in this account of a collector's work—excepting the extreme regularity of the system, and the ease with which the bills are distributed early in the quarter to the consumers. But mark the result of this system. Our collection for the last seven years has averaged 99·89 per cent., and for eight quarters not a single arrear has been carried forward. The introduction of so simple a system has saved a considerable sum of money in bad debts, &c., every year.

COMMERCIAL TRAINING.

My reason for giving an example of system as applied to the commercial side of our business is that in the training of a young gas engineer, his commercial instincts are usually left to develop by chance—no special training being given. Nearly all Provincial gas engineers have the management of the commercial part of the business under their control, as well as the manufacture and distribution of gas; and a great responsibility rests upon them, not only in conducting the affairs of their undertakings on thoroughly commercial lines, but also in advising their directors or committees as to the probable trend of markets for the purchase of their requirements and the sale of their products. In addition to these qualifications, it is necessary that every gas engineer should be able to advise his customers as to the best means of obtaining the greatest efficiency from the gas consumed, for lighting, for fuel, and for motive power.

ACTIVITY IN THE DISTRIBUTION DEPARTMENT.

It may appear to be late in the day to emphasize the necessity for gas undertakings to have a department devoted to the supply of all appliances for the consumption of gas; but, unfortunately, there are still a considerable number of places where the interest of the gas supplier appears to stop short at the meter. Having in view the severe competition of electricity, both for lighting and motive power, the gas supplier cannot afford to remain inactive. He, only, is in a position to actively combat this competition; and, without interfering in the least with the ordinary business of the local gas-fitters, he can offer such inducements to the consumer of electricity as may tempt him to transfer his lighting account to the gas supplier. The supplying of efficient and economical lamps and burners, and the yearly maintenance of them at a fixed price, may be mentioned as examples of these inducements. In Hull, we have a show-room equipped with an able staff of officers and workmen, and furnished with the most modern examples of efficient gas appliances. The lighting of tradesmen's premises, both internally and externally, has been made a special feature of this establishment; and to-day we have in use on the maintenance plan 1254 lamps, representing 5016 burners, nearly the whole of which have superseded electricity.

GAS-FIRES AND RADIANT HEAT.

The subject of heating rooms by means of gas-fires has received an increasing share of attention during the last few years; and the report of the experiments conducted by Mr. E. W. Smith and the Committee appointed by the Council of the Institution of Gas Engineers is an interesting addition to our knowledge on this subject. It is my opinion, however, that they have accepted too readily the theory that rooms can be heated by radiated heat alone. I admit that, in a room in which the air is already warm, the sensation of receiving heat from a radiant surface is a pleasant one; but it must not be forgotten that radiated heat, *per se*, cannot heat air. Even the sun's rays passing through our atmosphere do not appreciably raise the temperature of the air. If the sun's rays could communicate their heat directly to the air through which they pass, they could only reach the earth's surface after they had raised the whole atmosphere to a temperature that would be not only unendurable, but fatal to life. The sun's rays, as you are all aware, heat our atmosphere by convection—that is to say, they must first heat the surface of the earth, which, in its turn, gives up its heat to the atmosphere by convection. Is it likely that the

rays of heat from a puny gas-fire will act differently from those of the sun? Of course, it is pointed out that the rays of heat from a fire falling upon, and being absorbed by, the walls and furniture of a room, do, by convection, gradually heat the atmosphere of the room. That fact is granted. But surely there are more economical and efficient methods than this of heating air by convection. In all countries where the winters are rigorous, it is found by practical experience that the air of dwellings must be heated by convection to secure comfort. It is stated that heating air by convection dries it. Why should it? The mere heating of air does not decompose the moisture the air contains. At my request, the late Mr. Thomas Fletcher conducted experiments on this subject, and the results were published in our Technical Press. Mr. Fletcher found that there was no difference in the moisture of the air in rooms of the same temperature heated by incandescent gas-fire or coal-fire. Even when the room was heated by an incandescent gas-fire, assisted by a low-power air-heating arrangement, the results were the same. Dr. Rideal, in his interesting experiments on the relative hygienic values of gas and electric lighting, found that the action of the surfaces of a room had a considerable influence on humidity. He says: "These, though apparently dry, hold moisture in large quantities; so that a shallow layer of the surface of the walls and ceiling contains more water than all the air in the room. There is, ordinarily, a continual exchange between the air and the room surfaces—if either becomes moister, it gives up water; if either becomes dryer, it receives moisture. In this way, the walls serve as a compensating reservoir to help to maintain the humidity of the air approximately constant."

In heating rooms artificially, we must copy the lesson given us by Nature. Neither radiation alone, nor convection alone, can be satisfactory; but a judicious blending of the two will, I feel convinced, give the most satisfactory results. The best gas-fires of a few years ago aimed at this happy combination—whether by accident or design I am unable to say; but it is certainly true that those fires which, by their construction, yielded a large amount of convected heat and a fair proportion of heat by direct radiation, when fixed so that a good chimney draught was obtained, gave the most comfortable, most efficient, and most economical results.

THE ART OF ADVERTISING.

No gas engineer in these days waits for the customer to apply to him. He must discover the customer—he must attract public attention in season and out of season to the wares he has for sale. He must advertise freely and judiciously. As an old advertiser, I would warn against prolix advertising—advertisements which contain too much reading matter are apt to be cast aside unread. Let your advertising be novel, terse, and epigrammatic. Anything alliterative is almost sure to catch the public eye. I need scarcely say, unlike some advertisers, we must keep our advertisements well within the bounds of truth. Every year new business becomes more difficult to obtain; but I am sure I am expressing your views when I say that each one of us has confidence in the future of our industry. And, in thanking you for the patient attention you have given to this address, I wish each one may have a successful and progressive year.

At the close of the address,

Mr. T. Glover (Norwich) said it was his duty to move a vote of thanks to the President for his address. The members knew they would have a deliverance from Mr. Young that would be bright and up-to-date, and one to which it would be a pleasure to listen. Although it was out of order to discuss a presidential address, Mr. Young would permit him to congratulate him upon his 99·89 per cent. of collections, and upon the absence of bad debts. It was certainly splendid; and something for many of them to aim at. They were thankful to the President for his wise hints to the gas engineers who had pupils at their works, and to the young men who were aiming at becoming gas engineers; and particularly were they grateful for one wise sentence: "Let every day carry its own burden; the putting off even of small things results very quickly in an intolerable burden." If this was only remembered by the young as well as the old, it would do good. He also thanked the President for drawing attention to the fact that radiant heat thrown through space was of no use alone. He thought that, when radiant heat was being extolled so much, to the detriment of the other forms of heating air, it should be recognized that the great mistake that was being made was in heating air to too high a temperature on too small a surface. If they had a large volume of heat at a low temperature, in addition to the radiant heat, they would get much more pleasant effects. It was a fact that radiant heat alone was very expensive. They also agreed with Mr. Young's sentiments as to looking after their customers, and not leaving the customers to look up the gas suppliers. They also thanked him for his hints on gas advertising. The paper that Mr. Young read in Norwich some ten years or so ago was well in memory. Then he gave them some splendid hints as to advertising; and it was interesting to notice that their President had not changed his mind about this, and that it had proved so very successful.

Mr. J. H. Troughton (Newmarket) seconded the motion; and it was unanimously carried.

The President, in responding, said it gave him great pleasure to hear that he had not bored the members. The difficulty of producing an address increased as each one slid into the past. The next man who tried the job had a worse task to perform than his predecessor. However, if the address had given the members as much pleasure as it had him to write it, he was more than repaid for any little trouble he had taken. He thanked the members most sincerely.

Gas Practices at Great Yarmouth.

The members next proceeded to discuss the paper read by Mr. W. J. Carpenter at the Stamford meeting in April last. A report of the discussion appears on p. 828.

Gasholder Reconstruction.

Following, came a paper on the above subject by Mr. John Holliday, of the East Hull Gas Company. It was illustrated by a number of well-executed lantern slides. The paper, with the diagrams exhibited and some of the photographs shown, will appear in next week's issue. There was no discussion upon it.

Thanks to Authors.

Mr. Ruggles, in proposing a vote of thanks to Mr. Carpenter and Mr. Holliday, and referring to the paper by the latter, said it had been most interesting, especially the slides illustrating the progress of the works. The contractors in this instance must have hurried up well. The views showed distinctly what could be done if such work was to be carried out quickly.

Mr. J. Carter (Lincoln), in seconding, said they had listened to Mr. Holliday's paper with great interest, and had looked with equal interest upon the artistic productions he had projected on the screen. Both Mr. Carpenter's and Mr. Holliday's papers possessed the most useful qualities of contributions to the proceedings of such meetings.

The motion was heartily agreed to.

Mr. Holliday, in reply, said he had prepared the paper because he thought it would serve to create a little more interest in the holder the members were going to inspect next day. It had afforded him a great deal of interest to prepare the paper; and perhaps the difficulties met with in connection with the holder, and the way they had been dealt with, might at some time be of service to the members.

Mr. Carpenter also expressed his acknowledgments.

The Livesey Memorial Fund.

The President said the members would have noticed on the *agenda* that a resolution was to be brought before them respecting a contribution to the Sir George Livesey Memorial Fund. He had pleasure in proposing that ten guineas be voted from the funds of the Association towards this laudable object. It was quite unnecessary for him to add anything to the mere resolution. Sir George was a very great figure in the gas industry; and he was a great figure in the hearts of all who knew him.

Mr. Ruggles had much pleasure in seconding the resolution.

Mr. Wimhurst remarked that he was hoping the Committee were going to make the contribution twenty guineas. He understood from the Technical Press, after the June meeting of the Institution, that this was the sum to be contributed.

The President said he thought the funds of the Association were only large enough to warrant support to the extent of ten guineas. They would hardly be justified in giving twenty.

The motion was unanimously carried.

Place of Next Meeting.

The Hon. Secretary, at the request of the President, read a letter from Mr. Carpenter, of Yarmouth. The letter had reference to a proposal to hold the next spring meeting at Yarmouth; and Mr. Carpenter was pleased to say that, at a meeting of his Directors, it was resolved to offer a cordial invitation to the Association to visit Yarmouth in April next.

Mr. Wimhurst proposed that the invitation be received with hearty thanks. He well remembered the two meetings that were held at Yarmouth in the earlier years of the Association; and he knew they could not do better than receive the kind offer.

Mr. J. Auchterlonie (Cambridge) seconded the motion; and it was cordially passed.

Mr. Carpenter, on behalf of the Chairman and Directors of the Company, thanked the members for accepting the invitation. The Chairman and Directors were quite content to think that an Association of this character would honour Great Yarmouth by their presence. He could assure the members his Chairman and Directors, as well as himself, would do their utmost to make the meeting as interesting and instructive as possible. He believed the Directors of the Water Company, who were closely allied with those of the Gas Company, would extend an invitation to the members to visit their beautiful works situated in a beautiful locality. If this could be arranged, he was sure it would be a matter of pleasure and profit to everyone.

Mr. Wimhurst thought there would be an inducement to the members to stay the week-end at Yarmouth if the meeting were held on Friday.

The President said the point should receive the careful consideration of the Committee.

This concluded the business part of the proceedings.

Dinner.

In the evening, the members dined together; the President occupying the chair. The Mayor of Hull (Mr. H. Feldman) was unable to be present; but among the guests were a number of local gentlemen. After dinner, a few toasts were honoured.

Mr. J. J. Runton, the Chairman of the East Hull Gas Company,

proposed "The Eastern Counties Gas Managers' Association." He urged the members to take steps to put themselves on the same level as the civil engineers by obtaining a Charter for the parent body, as a pecuniary value would attach to it.

The PRESIDENT, in reply, said it was the friendly intercourse which took place between the members that made for the good of their profession. Some of them were old enough to remember the time when every gas engineer had a secret process of his own; but now "not a sparrow fell to the ground in Gravesend but what the man in Hull knew of it in a very short time." Their American brethren had not yet reached this pitch. They were very jealous of what went on inside their works. But they would get over this, and find that an interchange of ideas was beneficial to themselves. He did not know of any body of men who so freely gave of their knowledge to each other as gas engineers; and he was perfectly certain that as long as this spirit filled their hearts, the success of the Association was assured.

Mr. R. G. SHADBOLT thanked the British Gaslight Company and the East Hull Gas Company for their most hospitable reception of the members.

Major-General CORRIE and Mr. RUNTON having warmly acknowledged the compliment,

Mr. J. CARTER proposed "The City and Trade of Hull;" saying he was bold enough to enunciate his belief in the municipalization of gas-works. At the same time, he paid a tribute to the two Companies established in Hull.

Alderman G. HALL, in reply, said they had no fault to find with the British Gaslight Company, by whom the city was admirably served. In saying this, he was not speaking in any way disrespectfully of the other Company.

Sir ALFRED GELDER also responded to the toast. He said there was scarcely any occasion for the Hull Corporation to municipalize the gas-works, as there was in the case of others who were seeking new powers from Parliament. Hull was in a fortunate position; and he assured the members that the Corporation were quite happy and contented with the treatment meted out to them by the two Gas Companies in the city.

Mr. W. J. CARPENTER proposed "Kindred Associations."

Mr. T. GLOVER, in reply, said the parent body in London, as was shown by their meetings, was fully alive and active. It was healthy, and it was still needed. Their technical programme was followed with very great interest. It might be, as some of the Technical Press said it was, somewhat lacking in conclusiveness; but this must be so when they undertook new work and were breaking fresh ground. He hoped the members would not be impatient, but would continue to give them the support which was needed if the new work they had commenced was to be made useful to the industry as a whole. The conditions of the industry were constantly changing; and they needed to be alert to provide for these changes by adapting themselves to them. It was true that only those organisms survived which adapted themselves to their environment. They were met that night in an electrically-lighted room; and they had abundance of evidence everywhere they went that the electric light, which at one time they affected to despise, was not to be despised, but must be recognized as a permanent thing. At the same time, however, they had abundance of evidence that the gas industry was not being "snuffed out" by the success of the electric light. They and the communities they served had found other uses for gas than lighting; and consumers were only too glad to have it when it was supplied under conditions which enabled them to use it with advantage. So that if suppliers of gas adapted themselves to the new and changing times, there would be an extended existence for gas, and a future as brilliant, they hoped, with success as the past had been.

Mr. W. LANGFORD (the President of the Midland Association) also replied to the toast. He remarked that healthy competition was good in every industry; and he was not at all anxious or sorry that electricity had come in to compete with them as suppliers of artificial light. He believed that if they did their level-best to keep before their customers the advantages of gas for lighting and for heating purposes, they would have nothing to fear. On the other hand, they could not disguise the fact that the metallic filament lamp, as lately introduced for electric lighting, had come to stay, and was a powerful competitor with gas. Still, he saw no reason to fear the continued progress, and the ultimate success, of their undertakings. In the presence of the representatives of many of the best firms in England, he wished to say he did not feel satisfied with any of the gas-fires on the market. In his opinion, they wanted a fire which should be adaptable not only for the bedroom and the drawing-room, but also for their sitting and dining rooms; and at present—he wished to be candid—he did not think they had a fire they could recommend as they would like to do. He was pleased with the remarks in the President's address on the question of heating, and he urged that they must push heating and cooking by gas as much as possible.

VISITS TO THE HULL GAS-WORKS.

The following day the programme of instruction and interest was continued. At ten o'clock, the members were conveyed by carriages first to the works of the British Gaslight Company, over which they were conducted by the President and his Assistants. An outline of what was seen is supplied in the following description; but amplification of certain parts will be found in the illustrated articles that appeared in the "JOURNAL" for June 12 and 19, 1906, and in the paper on "Tar Distillation" read by Mr. Young at the meeting of the Association a year ago.

DESCRIPTION OF THE HULL WORKS OF THE BRITISH GASLIGHT COMPANY.

The area of land belonging to the Company equals 40 acres, of which one-half is occupied by the buildings and plant. On the eastern boundary, is the River Hull flowing on its way to the Humber; and, being a tidal river, a large proportion of the Company's coal is received by boat. On the other hand, they are able to forward their coke, pitch, sulphate, &c., to the docks by keels for shipment. On the south side, is the Hull and Barnsley Railway on the high level, attached to which are the Company's sidings, weighing-machine, and viaducts, supported on columns running into the coal-stores at the height of 14 feet, where all coal-waggons can be speedily emptied by opening the bottom doors. All other classes of goods received by rail are distributed over the works by the Company's own locomotive engine on lines specially laid for the purpose.

The coal received by river is filled into large pans, and picked up by hydraulic cranes, weighed, and dropped into the coal-breaker before being taken to the store by a gravity-bucket conveyor, which reaches from the river side to the far end of the coal-store. A specially-constructed trench runs the length of the coal-store below the floor level, where the gravity buckets can be filled with coal out of stock, and dropped into the elevator boot when necessary. There are four coal-stores with a total storage capacity of about 11,000 tons.

Carbonizing.—There are three retort-houses for this work; No. 1 house being the latest. It was built on the site of the old No. 1 house. This house was erected in 1904, and contains twelve beds (eights) of inclined retorts in two sections of six beds each, equal to about $1\frac{1}{2}$ million cubic feet per 24 hours. The coal is taken by the elevator and placed by the push-plate conveyors into continuous hoppers. The six-hour charges of coal for each retort are measured and dropped into the retorts, which are 15 inches by 24 inches and 20 feet long. The coke when drawn is taken by the hot-coke conveyor to the gravity-bucket conveyor and deposited in the yard. All the machinery in this house is driven by three gas-engines—viz., one for the coal into stock, one for the elevator and push-plate conveyors, and one for the coke-conveyors.

No. 2 house to replace the old No. 2 house is not yet built. No. 3 house was erected in the year 1884. It contains twenty beds (sevens) of horizontal retorts, 22 inches by 16 inches by 20 feet long. The beds are heated by direct firing; and all the work is done by manual labour. The house is capable of making $1\frac{3}{4}$ million cubic feet in 24 hours.

No. 4 house, which was erected in 1894, contains twenty beds (eights) of horizontal retorts, 15 inches by 22 inches by 20 feet long. This house can make $2\frac{1}{4}$ million cubic feet, has a stage-floor, and each through bed has one regenerator furnace, There is a coal-store on each side, from which the coal is admitted by sliding-doors into the coal-breakers and elevated into storage hoppers, two on each side, ready to supply the charging-machines. On each side of the retort-bench one charging and one drawing machine on the Arrol-Foulis system are at work; the complete installation having been supplied by Messrs. Sir Wm. Arrol and Co. Nos. 1 and 4 retort-houses are fitted with governors and tar-towers.

Condensers.—There are two atmospheric condensers (battery and annular) for No. 1 retort-house, and water-cooled condensers for Nos. 3 and 4 houses, erected by Messrs. Clapham Brothers, Limited.

Exhausters.—Four exhausters are in the main engine-house; two driven with horizontal and two with vertical steam-engines. The steam is raised in two Lancashire boilers fitted with Wilton's patent furnaces for burning breeze. There is also a hydraulic engine and accumulator in the house for driving the cranes on the wharf and hoist in the yard.

Scrubbers.—Two tower-washers, 42 ft. by 7 ft. 6 in. diameter, fitted with tar-extractors and wood grids above, also three tower-scrubbers (C. & W. Walker's make), 50 feet by 12 feet diameter, fitted with Livesey tar-extractors and filled with wood grids, are ready for use as required for dealing with the crude gas by washing with liquor; while two "Standard" scrubber-washers are used for the final washing with clean water. A portion of each of the "Standard" washers is also fitted for extracting naphthalene when necessary.

Purifiers.—The stream of gas is divided into two in passing through the purifiers; each section (A and B) consisting of six purfiers, 30 feet square by 5 feet deep, all fitted with Spencer's grids, which are found to greatly reduce the pressure and the number of times refilling. The purifiers are worked with four-way valves, and only oxide is used.

Meters.—There are two station meters—one 100,000 cubic feet and the other 150,000 cubic feet per hour.

Gasholders.—No. 1 is used for the carburetted water gas, while Nos. 2, 3, 4, 5, and 6 are required for coal gas. The two largest are Nos. 5 and 6. The former is 160 feet diameter by 108 feet high, and holds 2 million cubic feet; while the latter is 200 feet diameter by 120 feet high, and holds $3\frac{1}{2}$ million cubic feet.

Connections.—All the gas connections throughout the works are 24 inches diameter to the gasholders.

Governors.—There are three governors for regulating the supply of gas to the town.

Carburetted Water-Gas Plant.—This comprises two complete sets, erected in 1899, of Messrs. Humphreys and Glasgow's plant, each set capable of making a million cubic feet per 24 hours. There are two Lancashire boilers working at 100 lbs. pressure, and fitted with Wilton's patent furnaces for burning breeze. In the same building, there is room for two more similar sets of generators, &c. The purifiers are four in number, 30 feet square by 5 feet deep, and filled with ordinary grids and oxide, with the addition of a layer of breeze at the bottom to remove traces of tar. There is a separate station-meter for measuring the gas previous to mixing with the coal gas on its way to the holders.

Tar-Works.—These include five direct-fired stills, each capable of holding 2000 gallons of tar, with condensers, receivers, and

necessary storage tanks for the various distillates; the smothering chamber for cooling the pitch; and the pitch bed, where it is stored for shipment. All the stills are fired with coke. There is a Lancashire boiler, 28 ft. by 7 ft. 6 in. diameter, for supplying steam to the pumps and stills. There is also a complete plant for the recovery of anthracene. These works were erected 32 years ago. The products are naphtha, light oil, creosote, and pitch.

Sulphate-Works.—The still is by Messrs. C. & W. Walker, with liming-chamber included, and the saturator, of solid lead plate, was made by Messrs. Joseph Taylor and Co., of Bolton; the whole being capable of turning out six tons of sulphate per 24 hours. There are two Lancashire boilers for providing the necessary steam for still, pumps, &c., fitted for burning breeze. In connection with this department, there is a Claus sulphur recovery plant for dealing with the waste gases from the saturator after their condensation. These gases are passed through a washer to free them from tarry matter, and then into a kiln containing oxide of iron placed on checker brickwork. The gases, mixed with air, produce spontaneous combustion, and the sulphur is eliminated and deposited in a dry state as the burnt gases pass through a large brick chamber with baffle-walls placed crossways, 2 feet apart. A limestone tower washer throws down the sulphurous acid, and the sulphuretted hydrogen is passed into an oxide purifier—thus preventing nuisance. The amount of recovered sulphur is about 50 tons a year; and it finds a ready market.

Workshops, Etc.—There are blacksmiths, fitters, joiners, painters, and meter shops, stables for nine horses, stores, foreman stoker's room, and messrooms for the stokers and yardmen, with cook's kitchen and utensils. Adjoining are the lavatories and baths, &c., for general use by all workmen.

Water Softening.—All steam-boilers are provided with a supply of water softened in special storage tanks. The water is pumped from the river at low water and treated so as to reduce the hardness to a minimum. There are three tanks adjoining each other, any of which will last 24 hours, so that plenty of time is given for any sediment to settle. The freedom of the boilers from scale and corrosion is ample proof that the system is all that can be desired.

Leaving the works of the British Gas Company, the members drove to the works of the East Hull Gas Company, over which they were conducted by Mr. Holliday and his Assistants. Distinctive features of interest were the four-lift spiral-guided holder described by Mr. Holliday at the meeting the previous day, and the Feld sulphuretted hydrogen plant, which was described last week (p. 761), and upon which some further particulars by Herr Feld are published this week on p. 816. The system (the contractors for which are Messrs. R. & J. Dempster) was explained by Mr. Schmidt in the absence of Mr. Feld. The party afterwards visited the Garden City, and were then entertained at luncheon at the Royal Station Hotel by the Directors of the East Hull Gas Company. Mr. J. J. Runton presided. At this gathering, Mr. Holliday explained that the Feld process had merely been adopted for the sake of economy in the matter of ground space—they had not room enough to erect lime and oxide purifiers.

A Veteran in the Gas Industry.

Veterans in the gas industry, as well as those assisting in its modern improvements and triumphs, will be interested to learn that Mr. William W. Box, one of the earliest pioneers, is living in retirement at Herne Bay. Mr. Box, who is in his 88th year, is enjoying the best of health, and takes not only a keen interest in the progress of the gas industry, but also in every-day affairs and even in politics. Interviewed recently, Mr. Box stated that he entered the gas business in London, working for the firm of Mr. Barlow, whose son was the late Mr. Thomas G. Barlow, who founded and first edited the "JOURNAL." This would be about 76 years ago; so that Mr. Box may claim to be one of the oldest, if not absolutely the oldest, man in the gas profession. Under Mr. Barlow, Mr. Box, who was then a lad, assisted in the fitting-up of the first gas-works at Salisbury with three beds of three retorts each and a single-lift holder, making the first gas and lighting up the town. Thence, under the same firm, he proceeded to Romsey, erecting works of the same size, and giving that town also gas lighting for the first time. Subsequently Birkenhead was visited and equipped with similar works. Promotion now came to Mr. Box, and he was appointed Manager of the gas and water works at Chester for the London and North-Western Railway Company. Management of the works at Old Ford, Bow, followed; and eventually Mr. Box found himself at Newbury, in Berkshire. His position there he relinquished to take the management of a gas tube and fitting works at Birmingham, under Messrs. James Toy and Son. Management of the Walton-on-Thames Gas-Works under Mr. H. P. Stephenson, the Engineer, was the next move; and thence Mr. Box went to Ely, in Cambridgeshire. Finally he took service under the West Kent Gas Company at Crayford, and held the position of Manager for about thirty years. This was his last appointment. There is probably no man living who has had a more varied or a longer experience of the gas industry in its different branches; and, as illustrative of Mr. Box's inventive faculty, it may be mentioned that patents have been granted to him for luted retort-lid fasteners, anti-dips, a scrubber-washer, puttyless lamps, self-sealing mouthpieces, ascension-pipes, railway metal joints, horseshoes, furniture ball castors, and cupboard fasteners.

GAS PRACTICES AT GREAT YARMOUTH.

An Interesting Discussion on Commercial Topics.

It will be remembered that at the meeting of the Eastern Counties Association at Stamford on April 21 last, Mr. W. J. Carpenter, the Engineer and Manager of the Great Yarmouth Gas Company, read a paper on the above subject. It contained a large amount of compilation, and showed considerable industry in preparation on Mr. Carpenter's part. It was thought that, in order to do justice to the contribution, the discussion should be postponed to the autumn meeting; and therefore, at Hull last Thursday, the members gave the paper the consideration that the intervening time had enabled them to prepare for.

The President (Mr. John Young) said the meeting was open for the discussion of the paper. It was an interesting one, full of detail; and he was quite sure a number of members were anxious to say something about it.

Mr. F. Paternoster (Felixstowe) said he was glad the discussion on the paper had been postponed until that day, as it had enabled him to make a few comparisons which he would not have been able to do on the spur of the moment immediately after the reading of the paper. It was hardly a paper that one could criticize; but he presumed the chief object in postponing the discussion had been to enable others to compare the Yarmouth results with their own. He should be glad to tell the members what they had been doing at Felixstowe. But first of all he must thank Mr. Carpenter for the opportunity he had given him for doing this by publishing figures that were fairly comparable with his (Mr. Paternoster's) own; for to fairly compare the working of a company at a seaside resort with one supplying an inland town was in most cases an impossibility. The first points that struck him were the particulars Mr. Carpenter gave with reference to his slot-meter installations and the cost of collection. He said that at Yarmouth practically no limit was determined respecting the requirements of the slot-meter consumer. Mr. Carpenter made his collections twice monthly; and the average monthly amount collected per consumer was 4s. 2d. The cost of collection per annum was equal to 1s. 3·24d. At Felixstowe, they did not give the slot consumers everything they wanted. The question in his mind was whether Mr. Carpenter could not do as well by not giving them everything they asked for. He (Mr. Paternoster) went into the matter very carefully. At Felixstowe, they limited the installations to three lights, a gas-ring, and a point for a cooker. But they made consumers hire the cookers; and they had no difficulty in getting monthly rentals for them. The average monthly collection per consumer was 4s. 2⅝d., or ⅝d. more than in the case of Mr. Carpenter. But at Yarmouth, everything was given that the slot consumer asked for; at Felixstowe the slot consumer was limited. With a cooker, the average collection was much more—6s. 8d. Collecting once monthly, the cost to the Company at Felixstowe was about 1s. a year. Coming to the question of naphthalene, he (Mr. Paternoster) had no experience of it; but Mr. Carpenter made a curious remark in reference to the subject that had attracted his attention. The paper said:

> It is now an accepted idea in the management of gas affairs in Great Yarmouth that more trouble has been found through the deposition of naphthalene in the services after salt water had been substituted for that of the town water supply. This opinion has been formed by the close observance of the prevalence of complaints as to the supply of gas and otherwise in certain districts most freely deluged with the briny element.

He should like to ask Mr. Carpenter whether he meant to infer that street watering by salt water induced a deposit of naphthalene in the mains and services. Mr. Carpenter gave an interesting table with reference to his coke sales. He mentioned the tonnage per cent. of total sales; the local sales unbroken, and the local sales broken—tonnage per cent. of total sales. He (Mr. Paternoster) thought it would be interesting if he worked his figures out in the same way; and he had taken five years. He noticed that Mr. Carpenter's figure for 1904 was 28·5 per cent. of total sales of coke on rail; his own at Felixstowe was 37·58. The Yarmouth percentage of local sales unbroken was 58·3; that of Felixstowe, 59·26. The Yarmouth percentage of local sales broken was 13·2; that of Felixstowe 3·16. In 1908, the Yarmouth percentage of total sales on rail was 41·5; that of Felixstowe, 22·84. The Yarmouth percentage of local sales unbroken was 44·7; that of Felixstowe, 52·80. The percentage of broken sales at Yarmouth was 13·8; and at Felixstowe 24·36. Then he came to what was one of the most interesting tables in the paper. That was the one showing the yearly output of gas, with the proportion due to day consumption. He had taken Mr. Carpenter's figures from 1904 to 1908, and compared them with the same period at Felixstowe. Yarmouth figures for those years were 43·66, 43·43, 44·3, 45·01, 45·35; at Felixstowe they were 44·22, 46·19, 48·56, 51·62, 52·20. From this it would be seen that at Felixstowe they had succeeded in the last two years in selling more than 50 per cent. of the gas between the hours of 6 a.m. and 6 p.m. With regard to the other table showing the day consumption per cent. of the total monthly output, he had taken the same period of years. In 1904 the highest and lowest percentages at Yarmouth were 47·89 and 36·33 in December and April respectively; at Felixstowe, they were 47·39 and 41·18 for the same two months. In 1905, the maximum at Yarmouth was in July, 49·81; and the minimum in

March, 35·9. The same months were, peculiarly, the highest and the lowest at Felixstowe; but the figures were 54·73 per cent. for July, and 59·87 per cent. for March. They also topped 50 per cent. in June—viz., 50·88. In 1906, 50·33 was reached at Yarmouth in July as a maximum for the year. The same month was the maximum at Felixstowe—viz., 56·54 per cent., and over 50 per cent. was reached during that year for three other months—viz., 52·69 per cent. for June, 51·59 per cent. for August, and 52·32 per cent. for December. In 1907, over 50 per cent. was reached at Yarmouth in two months—viz., 50·42 per cent. in June, and 50·96 per cent. in July. At Felixstowe, over 50 per cent. was reached in seven of the months—viz., 51·31 per cent. in January; 54·36 per cent. in May; 56·93 per cent. in June; 56·63 per cent. in July; 57·56 per cent. in August; and 52·36 per cent. in December. He thanked Mr. Carpenter for an interesting and fascinating paper. He had given them a lot to think about; and it would be a very useful paper in years to come.

Mr. J. W. Auchterlonie (Cambridge) also thanked Mr. Carpenter for his paper, and congratulated him on the original manner in which he had presented it. With a paper so comprehensive as this, of course, the discussion could be almost unlimited. He took it the discussion would more or less resolve itself round the distribution and sales sections of the paper. In former times, gas managers spent a small part of the day upon distribution work. Now he thought they might with advantage spend more than half the day looking after the interests of the consumers and extending their business. Few concerns could now afford to treat the consumers in the autocratic way that Mr. Carpenter referred to in one part of his paper. The electric metallic filament lamp had increased the competition very considerably; and in spite of the facilities that gas companies had given in the way of hiring-out fires and cookers, and in doing gas fitting free up to a certain point, he thought they were faced with having to give still greater facilities and concessions. Many houses were being erected in which no provision was made for gas-pipes; and in other cases provision was made for only a gas cooker and one or two burners. The question had forced itself upon his mind, as it had upon other minds, as to whether gas companies should not take steps to see that these houses were carcassed free of charge, or at a small charge; because, unless the houses were piped when they were being built, there was little chance of them being piped at all. This was a question upon which he should like to have the opinions of his colleagues, and (if anyone had done this sort of thing) his view as to how far it was found necessary to go. Of course, in the cases that came under the manager's own observation, he could judge each one on its merits as to how far he should go to meet them. But in the cases that were left to inspectors and subordinates, it was quite conceivable that large sums of money might be spent unprofitably. It seemed to him they had now arrived at a position where it was but a short step to the consumer demanding burners and other appliances free. Another question that had been brought forcibly to his mind was as to whether gas companies should not inaugurate some system of free supervision of incandescent burners, radiators, and other appliances which needed regular superintendence. Of course, this enlarged scheme—fitters going round to supervise incandescent burners, &c.—would entail very considerable expense; and he thought that, instead of giving a penny reduction to the consumers, a company's interests would be much better served if they used the penny in some sort of concession, such as this one of looking after the company's interests inside the houses of consumers. It was manifest the British public would not bother about, or take the trouble to look after, their incandescent burners; and he was sure gas companies lost many customers through this indolence, whereas, if they had known (as they would have known if regular attention were given to these matters by the company), they might probably have easily retained them. He fully endorsed Mr. Carpenter's remarks as to the necessity of having educated and properly addressed fitters. There would be a little difficulty in securing the trained, intelligent——

Mr. Carpenter: There is Cambridge. (Laughter.)

Mr. Auchterlonie: No; not even at Cambridge. Could not, he asked, centres be established for the training of their young men. He did not think that many gas companies could independently afford to have lectures delivered by good men (unless undertaken by the engineers themselves) on such topics as water circulation, combustion, and such-like points. But if they could get up a series of lectures at a centre, and send their young men to them, they might by that means get the trained assistance they required. This would do a great deal of good for the gas interests. Mr. Carpenter had paid generous tribute to the work done by the Commercial Sections. He should not like to join issue with him there, as he had himself derived much benefit from the Eastern Commercial Section of their Association.

Mr. J. H. Brearley (Longwood) said he must endorse everything Mr. Auchterlonie had said with respect to the education of the fitters and outside staff; but he was afraid he could not quite agree that they had all the facilities for training young men which the President seemed to indicate, in his address, that they had. He (Mr. Brearley) believed, with the exception of the Leeds University, there was no college or scholastic institution in the country that looked upon gas engineering as a profession. If they took the syllabus of any of the local technical colleges, they would probably find a decent course was marked out for electrical engineering, beginning with mathematics, physics, chemistry, and so on; and leading up to the more complex technics of the subject. They had not got this for the gas industry; and he thought that the gas industry should take some steps to place gas engineering in their scholastic institutions upon a higher plane. In connection with his own pupils, at the beginning of the winter session of the classes, he had to pick out here and there, from the specialized courses of instruction, the subjects he considered most suitable to them as prospective gas engineers. This ought not to be; but the scholastic institutions should have specialized courses for the young men of the gas industry. The Gaslight Company had done something in this direction by arranging with the London County Council for classes which their fittings' pupils could attend, and the Provinces ought to wake up, and see that better provision was also made for them. Perhaps he might be excused if he referred for a moment to the examinations in "Gas Supply" of the City and Guilds of London Institute, which he thought afforded evidence that their young men wanted the means of education Last year, although it was only the second of the examinations on this subject, the number of candidates who presented themselves for examination in gas supply exceeded those in gas engineering; and he did hope that some combined effort would be made to render the facilities for these young men easier in the future than in the past. With respect to one matter in Mr. Carpenter's paper, with reference to the hiring of outside shop lamps, he felt sure every gas engineer would agree with him that it would be very interesting to have a primer on outside shop lamps. The types and variety of appliances and fittings connected with them rendered it a very difficult matter to decide which was the best type of lamp. If Mr. Carpenter could give them his views on the subject, they would be delighted to hear them. He (Mr. Brearley) had been hiring-out shop lamps for some years now; but the difficulty experienced had been that they did not last. In the case of certain lamps put on the market three or four years ago, he found their life was very short indeed; and he knew positively that hundreds of thousands of this type of lamp had been fixed. There was one other matter, in connection with slot-meter collections. Mr. Carpenter changed the collectors from one district to another; and he (Mr. Brearley) thought he was to be commended for the practice. But did he not think that was quite sufficient check upon the collector without giving the consumer a receipt? Many undertakings did not give receipts. Their issue had certain drawbacks, because if slot consumers had receipts, and found they had been doing well for the undertaking during the period, it would have a tendency to cause the exercise of more than ordinary care. Receipts of this kind had their disadvantages from the point of view of the gas undertaking.

Mr. R. G. Shadbolt (Grantham) said he thought it was Mr. Auchterlonie who stated that there was more in the distribution part of the paper than in any other part of it. That was so. If one would only cast his mind back to ten or twelve years ago, he would see what a great change had come over the scene. They would in those times have considered it *infra dig.* to have been discussing the commercial aspect of their business in the way they were doing now. This was the sign of the times. Something had been said—that, too, was by Mr. Auchterlonie—about devoting something like 1d. per 1000 cubic feet to cultivating the consumers and to looking after their requirements generally. They had at Grantham been looking after their consumers to the utmost of their ability; and their own fittings account came out to about the figure mentioned by Mr. Auchterlonie. Their first loss, including the little services to the consumers for which no charge was made in connection with fittings, including maintenance, amounted to 0·81d. per 1000 cubic feet of gas sold. In addition to that, as assisting the distribution department, there was the depreciation on cookers, fires, and so on (over and above the ordinary amount received as rent), which was equal to 2·83d. So that in these two items they had upwards of 3d. per 1000 cubic feet loss in rendering service to the consumers, in depreciation, and in other things. That was the direction in which they were being forced. Without going to any extent into details—that was, comparing point by point—he thought that most of them would run up against Mr. Carpenter with reference to his collection of the slot-meters, more particularly with regard to the frequency of the collection he advocated. It seemed to him (Mr. Shadbolt) wasteful to keep men running round every fortnight to these meters. Taking the cost per £1 collected. Whereas at Grantham, they collected £1 15s. 6d. per annum per meter, against £2 10s. at Yarmouth, it cost them with a bi-monthly collection, and there were no robberies, 3·7d. per £1 collected, against 6·1d. at Yarmouth. Mr. Carpenter was literally throwing away 2·4d., or £73 a year, or 65 per cent. more than the cost ought to be, if the bi-monthly system was in vogue. That, in his opinion, did not show economy; but no doubt in the system of collection, local conditions were a ruling factor. He could not help saying that he had noted the ingenious manner in which Mr. Carpenter had accounted for the increased number of so-called complaints. In this regard they were even bigger sinners at Grantham than they were at Yarmouth. Mr. Carpenter's complaints numbered 13·9 per cent. per annum of the number of consumers. The author of the paper attributed this to the greater attention paid to the consumers. If this was an indication that the gas authorities at Yarmouth were attending to their consumers more assiduously than they used to do, what would be thought when he told the members that the Grantham figure was 53·3 per cent. against the Yarmouth 13·9? When he added that absolute orders for work to be done amounted to 91·6 per cent., and that what used to be known as the complaint book had now grown into the request

and general complaint book, and that it contained 145 per cent. of total orders, complaints, and requests from the total number of the consumers, he thought it would be agreed that, from the way in which Mr. Carpenter had put the case, at Grantham they certainly attended to their consumers exceptionally well indeed. [Laughter.] What they had been accustomed to call complaints had, to a large extent, expanded into attending to consumers' requirements. And it was an eye-opener as to the innumerable requirements of their consumers. With regard to the maintenance of incandescent burners, that would, of course, depend upon what was done. At Grantham they maintained the burners of about 50 per cent. of the number of private consumers, which was equal to 21·6 per cent. of the incandescent burners in use. Something on the lines that Mr. Helps, of Croydon, and others were doing—that was to say, free inspection and a cost-price charge for the material used—was what unquestionably they were drifting to. As to coke sales, what was now being done in this direction was largely the outcome of the Commercial Sections. Of course, in this matter local conditions must come into play. Whereas Mr. Carpenter found he had run up his broken coke sales to 14 per cent., he (Mr. Shadbolt) had run his up to 33 per cent., of which the Grantham total was 27 per cent., and outside 6 per cent. There were other works that had developed their domestic broken coke sales to a similar extent. Summing up the paper generally, Mr. Carpenter had lucidly summarized for them the effect of the increasing demand brought about by the extended use of cookers and various other kinds of appliances, and its effect upon the general management and output—more particularly when the comparison was made on annual output. The question that presented itself to his (Mr. Shadbolt's) mind, and to that of others, was what, after all, was the net result upon their operations as gas manufacturers and suppliers of all this striving after little economies; and if this work did inflict a little loss what was the net result? It appealed to him in this way, that the great result over the whole of the operations was that the capacity of the generating plant and distributing plant was materially increased by this levelling-up of the load—by bringing up the day consumption, and so increasing the consumer's total consumption. In his own case, he found that twelve years ago, comparing the maximum week's output with the minimum week's output, the maximum week's output was 4·15 times the minimum week; whereas at the present time it was only 1·96. The effect of this upon the year's output was that, in his own case, if they took it on the maximum day's capacity as compared with the annual output, it would be found that the total plant had increased in capacity by over 18 per cent. in the twelve years, or on the maximum day's capacity by 21·66 per cent. on the year's total producing capacity. The capacity of the distribution plant had been increased by no less than 20 per cent. This then was the economy of this work on production and distribution; and it was a mutual benefit both to producer and consumer.

Mr. George Helps (Nuneaton) said that some seven or eight years ago they undertook the free carcassing of houses at Nuneaton, and gave it up because it did not pay. His experience was that, keen as the electric light competition was in his town, people would not use gas any the more though piping was given free. With regard to the supervision of burners, he was quite in accord with what Mr. Auchterlonie had said. He thought there would be few present who would not agree that free maintenance of burners was to come, and come shortly. Their experience at Nuneaton with a large number of slot consumers was that, if the Company did not maintain the burners, gas would not be consumed. Some of those present would recollect the paper he read about nine years ago on the disadvantages of the slot business. Those disadvantages were, of course, attributable to the low consumption per consumer at Nuneaton—then only about 6000 cubic feet, though they were putting in any number of burners wanted, and a cooker costing £4 10s. Some of the members then disagreed with him. Perhaps that was because he did not put his points before them in the manner he should have done. They had now in operation a system of semi-maintenance—not entire maintenance—of the slot consumers' fittings; and this had put up the consumption to nearly 9000 cubic feet per consumer.

Mr. T. Shadbolt (Kirkby-in-Ashfield) said there was one point in the paper that appealed specially to him—that was, the slot-meter collection; and for this reason, that he had four slot meters for every one ordinary meter in use. The slot-meter system was therefore to him a very big thing. At the outset, he would like to confirm, from his point of view, what their friend Mr. Brearley, had said with regard to the giving of receipts. He commenced the system by giving receipts; but after the experience had proceeded twelve months, he found that the giving of receipts entailed more disadvantages than one, and so he was anxious to discontinue the system. His co-officials under the Council said the Local Government Board auditors would not permit him to do this; and this would be an insurmountable difficulty. But he went at once to the Local Government Board auditor, and got his permission. He had found that not giving receipts was the cheapest system of collection; and he had had ample proof of the fact that, in respect of the amount of the consumption, "where ignorance is bliss, 'tis folly to be wise." [Laughter.] As to the figures of cost, Mr. Carpenter had invited discussion by comparison; but he thought comparison was difficult. There were a great many factors that entered into the case. Wages, for instance. He had himself to pay the union standard of wages. Consequently, his men were very well paid for the work they did. Although Mr. Carpenter might beat him on the figure, he could beat him on the figure. This might sound paradoxical. He admitted that it all rested on how many collections they made in the course of the year. In his case, they had four only. He suggested that the more correct way of comparing would be to base the price on the cost per visit per meter. His cost per collection came to 3·52d. per year per meter, on Mr. Carpenter's basis—that was slightly under 1d. per meter per visit. Mr. Carpenter's figure was a little further under 1d. per meter per visit; but his total cost was 1s. 3d. a year per meter, against his (Mr. Shadbolt's) 3·52d. He (Mr. Shadbolt) did not lose 1s. a year by robbery. In some cases, it might be worth while to spend so much money; but, in other cases, it would not be. It was all a question of local conditions.

Mr. Thomas Glover (Norwich) said he only wished to express his appreciation of the paper, and to emphasize one point—that was, that they could congratulate Mr. Carpenter for instituting the comparison between day and night consumption. He (Mr. Glover) thought Mr. Carpenter was the originator of this comparison; and perhaps sufficient acknowledgment had not been made of the fact, because he thought is was going to be of great value to the gas industry in the future. Like others, he was not in agreement with every one of Mr. Carpenter's methods. He quite appreciated all that had been done at Yarmouth to increase consumption, and to cheapen gas in the production; but he did not agree with the method of slot-meter collection. Some of them probably had heard the tale of the negro, who, when told that the sun never set on the British Empire, said, "What a dishonest people these Britishers must be, if they cannot be trusted in the dark." The Yarmouth people must be very dishonest if collections from their meters had to be made every fortnight. He ventured to say this cost more than it was worth. If they applied the same system at Norwich (where each slot collector looked after some 3000 meters in place of only 1000 at Yarmouth), if they were to increase their collection so as to make it proportional with Yarmouth, it would cost them £1000 a year. He did not now lose that much by robberies.

The President remarked that they all seemed to have this slot collection very much in their minds. Of course, circumstances must influence each manager in his ideas as to how to conduct his business. In Hull, they had some 20,000 slot meters; and they collected them once a quarter. The loss by robbery last year was under £15. Now if he had to collect twice a quarter, it would cost him £400 per annum to try and save £15. Mr. Carpenter in Yarmouth found it was necessary or beneficial to collect the money from his meters very often. It was difficult to make any comparisons of that kind. He quite agreed with Mr. Auchterlonie and Mr. Brearley that trained assistants for inspection of fittings were difficult to get, but they were coming. It was quite true that the technical colleges of the country had not issued syllabuses such as Mr. Brearley had indicated, but evening classes in gas supply and gas engineering were well attended. In Hull they had such classes; and to his own fitters, and the young people about the works, he offered prizes to each one who gained an ordinary pass or honours certificate in the first or second class. Each one had a prize in accordance with his merit; and if a student put in a sufficient number of attendances during the session—thus showing that he was interested in his business—he (Mr. Young) paid his fees. The result was they were getting a more educated and more intelligent class of young fellows growing up around them, and inspection and maintenance duties were being better fulfilled. There was no doubt that inspection was coming along with rapid strides; and they would have to educate their young people into an intelligent understanding of all the pieces of apparatus they had to handle and attend to in the consumers' houses if they wished to ensure success. He desired to compliment Mr. Carpenter upon his paper. It must have been a tremendous labour to compile the statistics he had given; but it would be useful to them in finding out all the small details where they could save money for their companies or corporations as the case might be, and so supply gas at the cheapest rate to their consumers.

Mr. Carpenter, in replying to the discussion, said Mr. Paternoster's experience seemed to be more or less the same as their own with regard to slot meter consumers. He only collected ⅜d. more than they did at Yarmouth. Respecting the other question about salt water and naphthalene. They thought—in fact, they were sure—when they got what he described as the "briny element" and the temperature was lower they had more trouble. As the members knew, the naphthalene would comb out at rather a lower temperature than at a higher one. They were not much annoyed with naphthalene just now, because they were not troubled so much with the briny element; they had been getting too much of the other this summer, so that the roads did not require watering so frequently with salt water. Mr. Paternoster had mentioned coke in connection with the table in the paper. That, as they all knew who were in the commercial sections, was essentially a local question. He had brought forward what he thought were his top figures, and was glad Mr. Paternoster had taken the trouble to compare them. But when he (Mr. Carpenter) wrote the paper, it was not to show particularly what they had done at Yarmouth, so much as to state what had been done in order to give an opportunity for comparison. And therefore he had had a great deal of pleasure in hearing all that had been said. The point as to slot-meter collection and receipts had been emphasized. Some of the members said that it was not

necessary to give a receipt, but to simply collect the money. At Yarmouth, they held a different view. No bargain was good unless it was satisfactory to both parties. Every one was entitled to a receipt when they paid for anything. Therefore they gave their slot consumers a receipt; and he thought it was due to them, when they asked for a receipt, that they should have it. He did not think from his experience that the consumers burned less gas because they knew what they had consumed. He thought the consumers derived satisfaction in knowing that they were exercising a certain amount of economy; and this had a good effect. It was generally found that, if they had a bad consumer, he was not a profitable one. The best consumer was the one who was contented. As to Mr. Brearley's remarks, there were no technical schools for fitters at Yarmouth; but at the same time he did not see why each company should not institute an educational system of their own. At Yarmouth they had instituted the system of apprenticeship. By such a system, if they put the boys with a good man, they were teaching them something they could not get at Cambridge. [Laughter.] He thought that, in this matter, they could individually help things considerably. He did not say they could deal with the ordinary gas-fitter. The ordinary gas-fitter was a most difficult man to deal with. But, after all, he did not see why they should not try to get their technical schools to have gas-fitting classes, similar to those for plumbing. If they could provide plumbing classes, why not gas-fitting ones? The further gas undertakings got into the question of free inspection and maintenance, the more gas-fitters would be required. This was a matter, however, that each manager must deal with in his own sphere; and each one must see what could be done to push it forward. Regarding outside shop lighting, they had done a great deal of this at Yarmouth. In fact, they did not stop at anything. If they found that these outside shop lamps wore out, then his advice was, "Scrap them, and get some more." He found that their electrical friends were everlastingly doing the same thing. They did not tell the Gas Company what they were doing; and the Gas Company did not say anything, but the officials thought a tremendous lot, and acted as they considered best. They were doing a great deal; but they did not publicly recognize the fact. [Laughter.] No one could be more emphatic than he in regard to distribution. They had not heard the last word about it. They would no doubt be meeting at some future time talking about distribution in other new lights; and there would be a discussion equally good to that they had had that day. All he hoped was that some little profit would result to others from his paper. For the appreciation concerning it that had been expressed, he was deeply thankful.

STEEL TUBES FOR DISTRIBUTION IN HOLLAND.

A few days ago, the Association of Directors of Water-Works in the Netherlands held their annual meeting at Nymegen. About 70 members were present, and they inspected the new pumping-station and electricity works erected by Heer Van Spall for the Municipality of Nymegen. The electricity, which is to compete with the established gas supply of the town, is to have a day-load at the pumping-station; and in this respect the scheme is somewhat novel. There was a fine installation of centrifugal pumps driven by electric motors. Later on there will no doubt be added also the electrification of the existing steam tramways. In Holland there are upwards of 100 miles of Mannesmann steel tubes in use for gas and water; three water companies using them exclusively. Consequently, the matter of service connections has been exercising Dutch engineers; and at the meeting a demonstration was given of the Woodall-Parkinson expansion nipple by a representative of Messrs. J. Stone and Co., Limited, of Deptford. A 6-inch steel tube was rigged up on trestles at the water-works, one or two tappings made, and nipples expanded and joints made in the way which is now familiar in this country. Then the water was turned on (about 100 lbs. pressure), and a tapping made under pressure with Stone's Morris machine, which also inserted the nipple and mandrel. The expansion of the nipple under pressure by withdrawing the mandrel through the specially designed plug-ferrule was operated without any loss of water. The President of the Association thanked Messrs. Stone for the trouble they had taken in preparing the demonstration.

The "Engineer" learns that a gas-driven street-car is now under construction in Philadelphia, which is to be tested on the line of the Metropolitan Street Railway Company of New York in competition with the electric cars of the Company. It will be driven by two four-cylinder motors, each of 24 H.P. These will be water-cooled, and piping will be led from the motor-jackets round the interior of the car so as to heat the latter during winter service.

A bronze statue of the late Colonel S. B. Bevington, who was the first Mayor of Bermondsey, is to be erected in the Tower Bridge Road, opposite the new technical college now being built by the Leathersellers' Company. It will be a full-sized representation of Colonel Bevington in his mayoral robes, and, with the stone pedestal, will be 10 feet high. The artist whose work has been accepted is Mr. Sydney March, of Globe Place, Chelsea, who, it may be remembered, designed the bust and pedestal of the Livesey Memorial, as well as the alcove in which the memorial stands, at the works of the South Suburban Gas Company.

WHAT QUALITY OF GAS IS CALLED FOR?

By Dr. H. Bunte, Professor at Carlsruhe Technical College.

The lecture dealing with this question delivered at the meeting of the German Association of Gas and Water Engineers at Frankfort-on-the-Maine in June last by Professor H. Bunte, the General Secretary of the Association, has now been published (with some added matter) in the form of a communication to the "Journal für Gasbeleuchtung." We give below a summary of its contents, with particular reference to the points not dealt with in the general report of the proceedings at the meeting, as published in the "Journal" at the time (Vol. CVI., p. 968).

There was presented at the first meeting of the German Gas and Water Association in 1859 a paper dealing with a generally applicable mode of judging the quality of gas; and having regard to the great changes in methods of manufacture, and more particularly in the manner of use of gas which have taken place in the last decade, it seems appropriate at the Jubilee Meeting of the Association to reconsider the subject which was thus debated at its first meeting. It would be interesting to trace the history of the topic from that date to the present time, and to discuss its probable developments in the future; but except so far as a few references to past experiences are concerned, the author has deemed it prudent and necessary to confine his treatment of the subject to the present.

It is unnecessary to look beyond Frankfort-on-the-Maine for proof of the fact that requirements in regard to the quality of the gas are extremely diverse, even in the same place and at the same period. For many years past there have been in this city competitive supplies of poor and rich gas to meet the needs of the people for a gaseous fuel for lighting, heating, and development of power. At one time, too, the quality of gas was sufficiently indicated by prefixing the name of the material from which it was produced—as coal gas, wood gas, oil gas, &c. Then simple photometers were introduced. The bunsen grease-spot photometer possessed the same pleasing simplicity as the bunsen burner, which its inventor devised about the same time. The illuminating power of the gas thus became the most important criterion regarding its quality; the standard of measurement being in early days the spermaceti candle, which was then in actual use in the best houses in England for illuminating purposes. In Germany, wax, stearine, or paraffin candles were frequently used as standards. For the last 25 years, the Hefner lamp has been in general use, and has attained international recognition as a simple, readily reproducible, and constant standard for the determination of the intensity of light.

The improvement of the standard of light, however, only solved satisfactorily one part of the whole problem—viz., the measurement of light. It did not afford a sure criterion of the quality of the gas, since a very different illuminating power or intensity of light could be obtained from the same quantity of gas by varying the conditions of combustion, such as the design of the burner, the pressure of the gas, and the regulation of the air supply. At the present time, a burner—viz., the "Carpenter"—is prescribed in England for the photometry of gas, which cannot be used for practical lighting, but which, through the regulation of the air supply, gives a flame of 16-candle power with gas from which in the flat-flame or the ordinary argand burner only 8 or 10 candles would be obtained. Thus the conditions of combustion have great influence apart from the quality of the gas; and photometric testings therefore afford merely a comparative, and in no sense an absolute, measure of the character of the gas. There has been no lack of proposals to determine the quality of gas in other ways, such as by the estimation of the proportion of so-called "illuminants" by absorption by bromine, or by measurement of the proportion of air required to make a gas-flame absolutely non-illuminating. But these proposals were passed over, and photometric testings sufficed as long as the gas was used almost wholly for lighting in flat-flame and argand burners.

The introduction of the Welsbach burner, and the increasing use of gas for heating purposes, rendered the old photometric method of testing the quality of gas entirely purposeless, because in certain conditions a gas would give a better lighting duty in the incandescent burner than another gas which by the old method of testing would be returned as of better quality. The necessity for a practical method of assessing the quality of gas in the new conditions was recognized in the appointment, at the International Gas Congress held in Paris, of an International Photometric Committee, who had their first session at Zürich, in 1903. On that occasion, M. Sainte-Claire Deville proposed to assess the quality of gas according to its calorific power. He showed that there was a close correlation between the heat of combustion of gas and its illuminating power when consumed in the incandescent burner, and that within certain limits the illuminating power was proportional to the calorific power of the gas. While this proposition is supported by certain theoretical considerations, it is antagonistic to others; and with a view to proving its correctness, the author has had a number of researches carried out in recent years in his laboratory on the relation between the calorific power of gas and its illuminating power in the incandescent burner. The results of these researches have been reported in a communication by Dr. M. Mayer and Herr A. Schmied, who, in conjunction with Dr. Stöcker and Herr Rothenbach, carried them out. It need

only be said now that these investigations were made on mixtures of coal gas with from 10 to 75 per cent. of hydrogen, or from 15 to 60 per cent. of carbonic oxide, and that the calorific power of the mixtures ranged from about 360 to about 590 B.Th.U. per cubic foot. The gases were consumed in turn in the same incandescent burner, in the same conditions, with the theoretically required proportion of air added in the bunsen burner. Thus the highest temperature and maximum illuminating power were attained, so that the values are strictly comparable. The results of the investigations are shown graphically in figs. 1 and 2, in which the abscissæ refer to the amount of heat supplied to the burner in unit time, and the ordinates the number of Hefner units found by the photometer. If the illuminating power developed in the incandescent burner were exactly proportional to the calorific power of the gas, the curve for each sample of gas would

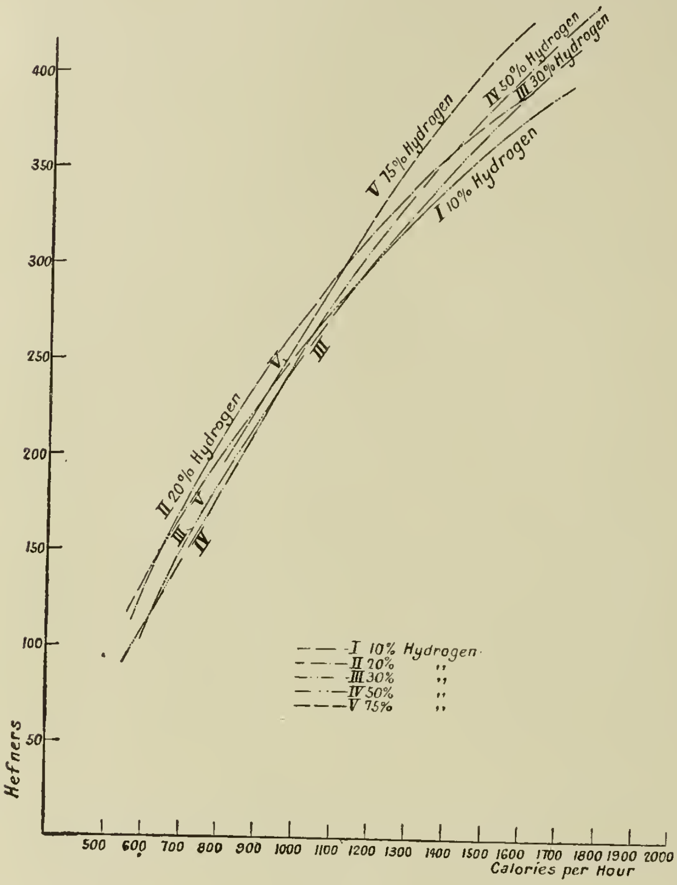


Fig. 1.

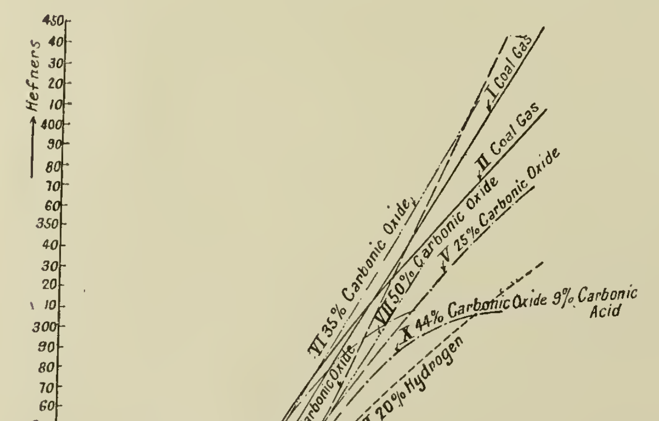


Fig. 2.

be a straight line. It will be seen that the curves are in fact nearly straight lines. Complete agreement cannot be expected owing to unavoidable errors of experiment, changes in the mantle, and the adaptation of the burner to consume at one time three times as much gas as at another.

If the gases were all of equal value relatively to their calorific power, the curves theoretically should all be identical. That they are slightly divergent is not surprising, having regard to the wide differences in the composition of the gases and to the experimental difficulties. But it is evident that the curves must in the circumstances be regarded as lying very close together. On the other hand, it may seem surprising that gases of such widely different descriptions should behave so much alike. The explanation is afforded by the fact that even the most different gases yield the same products of combustion—carbonic acid and water vapour diluted with large quantities of atmospheric nitrogen—and that the theoretical limit of temperature in the extreme cases of the samples of gas investigated ranges only from 1923° to 2033° C. Other influences, dependent on the nature of the constituents of the gases—such as size and shape of flame, dissociation ratios, &c.—naturally also affect the result. But the influence of the calorific power of the gas is paramount; and hence the following practical rule may be accepted for stating the quality of gas. The illuminating power of the incandescent gas-burner is *cæteris paribus* nearly proportional to the amount of heat supplied in unit time, and, consequently, to the calorific power of the gas. That is to say, to produce the same light in the Welsbach burner, in the same conditions, about 25 per cent. more must be consumed of a gas of 400 B.Th.U. per cubic foot than of a gas of 500 B.Th.U. per cubic foot.

The fact enunciated in the foregoing rule indicates that the calorific power affords a standard of measurement of unsurpassable reliability for the assessment of the quality of gas. The same could not be affirmed of the determination of illuminating power by the old photometric method. Moreover, the calorific power is the only criterion by which the value of gas may be judged for all its domestic and industrial applications other than lighting—such as for cooking, heating, and the supply of gas-engines. The calorific power expresses exactly the amount of energy in the gas, which energy may be applied at will for lighting, heating, or development of power. Moreover, the calorific power or heat of combustion is an absolute measure or scale of value, which is independent of the method of combustion, of any apparatus, and of all other conditions of combustion. Whether the gas is burnt in air or in neat oxygen, the same calorific power will be obtained for a particular gas with any practical instrument constructed on scientific principles. Calorific power therefore affords that generally applicable measure or standard for the assessment of the quality of gas which was spoken of at the first meeting of the German Association in 1859. The old photometric tests of gas-flames, with all their errors, may therefore be entirely dispensed with. The determination of calorific power, moreover, has yet another important advantage over photometric testing in that it can be made wholly independent of the personal element, quite automatic, and as a continuous record. [There are quite practical self-recording calorimeters based on scientific principles in existence.] In photometry, on the other hand, the personal collaboration of a trained observer is a necessity.

The next point is: What ought to be the calorific power of the gas? Different views may be held in regard to this question, according to time and circumstances. Two years ago, at the meeting of the German Association at Mannheim ["JOURNAL," Vol. XCVIII., p. 810], the author advanced the opinion that gas should not fall below 5000 calories per cubic metre at 0° C. and 760 mm. gross calorific power—522 B.Th.U. per cubic foot at 60° Fahr., 30 inches, and saturated. He did not intend thereby to set up a definite standard, but rather to avoid abuse, perhaps unintentional, of the freedom which the introduction of the incandescent burner has afforded in regard to the quality of gas. Meantime, no objection has been raised to that limit. If, however, it is taken as a minimum value, below which the gas must not fall, a somewhat higher figure will have to be observed in normal working—say, 5200 calories per cubic metre—543 B.Th.U. gross per cubic foot at 60° Fahr., 30 inches, and saturated—which is the standard observed in the Municipal Gas-Works at Berlin. This would afford latitude for unforeseen changes in working, whether of the coal or of the operations on the gas-works. It is, however, of great importance that there should be as small fluctuations as possible in the quality and pressure of the gas supplied, as the air supply to the bunsens, whether of modern incandescent burners or of cooking or heating burners, depends thereon. Fluctuations affect the efficiencies of the burners, and may lead to great inconvenience through the striking-back of the flames. Apparently fluctuations of 100 calories (say, 10½ B.Th.U. per cubic foot) above and below do not cause appreciable disturbance of the working of the burners, and in many cases even greater fluctuations are tolerated.

If the effect on its value is considered of the individual constituents of the gas, apart from hydrogen, methane, and heavy hydrocarbons, it will be found that, owing to the universal use of the bunsen burner in some form for every purpose of lighting and heating, a great simplification of the conditions has really ensued. When flat-flame and argand burners were used, the proportion of carbonic acid in the gas was of great importance, as this gas caused the carbon in the flame to be consumed to carbonic oxide, which burns with a blue flame, and thereby greatly diminished the light

produced. Hence the carbonic acid had in most cases either to be removed at great expense and inconvenience, or the required illuminating power had to be maintained by the use of enriching agents. For the present use of gas in the Welsbach burner, however, the carbonic acid is of little importance, as it acts mainly as a diluent. It should be remembered that before the gas reaches the mantle it is burnt in the inner cone of the flame to a mixture of carbonic acid and carbonic oxide, water vapour, and hydrogen, and so becomes a water gas diluted with much nitrogen. This is burnt completely when it reaches the outer cone of the flame. The same applies generally to air, oxygen, or nitrogen in the gas. The old flat-flame was very injuriously affected by them just as by carbonic acid; but in the incandescent burner a great deal of air is purposely introduced into the bunsen, and a small proportion of air in the gas has therefore no directly harmful effect. It merely dilutes the heating constituents, and thereby reduces the value of the gas. The gas must, however, in all circumstances have as nearly as possible the same composition, as modern more refined lighting and heating appliances, and the inverted burner in particular, are much more sensitive to variations in composition of the gas than the old open-flame burners. If coal gas only is supplied, its composition is affected more by the conditions of carbonization than by the particular coal used—provided it is a gas coal. But if either simple or carburetted water gas is added to the coal gas, great fluctuations in composition may result, and care must be taken in regard thereto, especially in small gas-works; otherwise great trouble may ensue from the firing-back of consumers' burners, particularly cooking appliances. A number of devices have lately been put on the market for testing gas with the object of ascertaining the proportion of air it requires for its combustion. These are based on the same idea as the old gas-tester of Erdmann, which thus receives due recognition.

A few words may be said regarding the use of coke-oven gas for town supplies. According to the author's observations, it is possible, by careful management of the plant and supervision of the working, to obtain from coke-ovens a gas which is of exactly the same value as the coal gas of gas-works, and is quite satisfactory in regard to uniformity of calorific power and of composition. The author is therefore convinced that the surplus coke-oven gas resulting from properly-installed regenerative coke-ovens will yet play an important part in the supply of the population of industrial districts with gaseous fuel. The attention of gas-works in such districts may be again directed to this question.

Sulphuretted hydrogen is the chief of the impurities which are separated from the crude gas by the purifying plant of gas-works. A century ago Clegg effected its complete removal by means of lime; now it is easily removed almost universally by oxide of iron. Hence gas wholly free from sulphuretted hydrogen has for years been demanded and supplied. In regard to the traces of other sulphur compounds—chiefly carbon bisulphide—no practically applicable process has even yet been found for the complete absorption of them in the extremely small amounts in which for the most part they occur in gas. Nevertheless, success in the efforts being made to discover such a process would be welcome, as many objectionable occurrences, in connection with heating by gas in particular, could thus be overcome, and many otherwise suitable coals which have hitherto not been used on gas-works, on account of their richness in sulphur, could then be utilized. From the hygienic standpoint, there has been no objection raised in Germany to these compounds. On the other hand, authorities on hygiene in that country have repeatedly drawn attention to the increase in the proportion of carbonic oxide caused by the extended admixture of water gas with coal gas, and limits have been proposed for the amount of water gas which may be used. As carbonic oxide is the poisonous constituent of illuminating gas, it would certainly be desirable to remove it completely from the gas; but there is no practically available works' process for effecting its removal. It may be pointed out, however, by way of suppressing exaggerated fears in regard to it, that upwards of 36 to 40 per cent. of carbonic oxide is contained in wood gas, of which the manufacture was considerably improved by that great authority on hygiene, Pettenkofer. On his recommendation, wood gas was introduced about the middle of last century into many towns in South Germany far distant from the coalfields; and it was only with the improved facilities of transport for coal and the increasing cost of wood that this wood gas was ultimately supplanted by coal gas. For several decades the towns were supplied with wood gas rich in carbonic oxide, and, indeed, only a few years ago the bathing resort of Reichenhall converted its gas-works for the supply of coal gas in place of wood gas. This was the last of the wood-gas works of South Germany; and the conversion was made on economical, not on hygienic, grounds.

Of the other impurities of crude coal gas, ammonia and cyanogen are removed as completely as possible by gas-works in their own interest, as they constitute valuable bye-products, the means for the recovery of which have of late years undergone great improvement. In regard to the removal of these impurities and of naphthalene, the financial interests of the gas-works are incentives superior to any prescriptions. In this connection, it may be mentioned that at a conference of gas-works chemists, which was held at Carlsruhe in May last at the instance of the Council of the German Association, and in which about forty chemists participated, the question of the quality of gas which was now called for was discussed. Although the proceedings were not public, it may be mentioned without breach of confidence that there was general agreement on the following points in regard to the quality of gas required at the present time: 1. A gross calorific power of 5200 calories per cubic metre at 0° C. and 760 mm. (543 B.Th.U. per cubic foot at 60° Fahr., 30 inches, and saturated) is recommended for adoption as a standard. The calorific power should fluctuate as little as possible, and should not fall below 5000 calories per cubic metre (522 B.Th.U. per cubic foot at 60° Fahr. and 30 inches). 2. Tests of illuminating power are superfluous in the present position in regard to the use of gas. 3. A proportion of 25 per cent. of carbonic oxide is permissible in mixed gas. 4. The gas must always be wholly free from sulphuretted hydrogen. There is at the present time no technically applicable process for the removal of the other sulphur compounds which are retained in small quantities in the crude gas. No maximum limit can, therefore, be fixed for their amount. 5. Special tests for enforcing restrictions on the amounts of ammonia, cyanogen, naphthalene, carbonic acid, oxygen, and nitrogen in purified gas, or in regard to its specific gravity, are considered unnecessary.

The most important of these conclusions are comprised under the headings 1 and 2. The grounds on which they are based from the point of view of the users of gas have been sufficiently indicated; but a few remarks may now be made from the gas manufacturer's standpoint. In the first place, if the quality of gas is no longer to be assessed according to its illuminating power, but according to its calorific value, valuation of coals for gas making is put upon an entirely different basis. The "sperm value" of a gas coal, which varied according to the conditions of carbonization, owing to the extreme sensitiveness of the illuminating hydrocarbons to exposure to high temperatures, becomes of no significance. It is true that the conditions of carbonization affect also the calorific power of the gas produced, but in a much smaller degree. Moreover, calorific power serves as the basis of valuation of both the coal used and of the gas made. Hence those coals will be preferred for gas making which admit of the largest proportion of their heating value being transferred by distillation into the form of gas. To take an example, if a coal possesses a calorific power of (say) 14,000 B.Th.U. per pound of dry ash-free coal substance contained in it, and on carbonization yields 3500 B.Th.U. per pound in the form of gas, or 25 per cent. of its original heating value, it should be preferred, *cæteris paribus*, to another coal which only yields 20 per cent. of its heating power in the form of gas. There are, of course, other considerations which also affect the choice of coal—such as the quality and quantity of the bye-products. Most important of these are the quantity and quality of the coke, ammonia, and tar produced, and the more or less rapid rate at which the coal gives off its gas. But the principal determining consideration must always be the quantity and quality—*i.e.*, calorific power—of the gas produced. The results of investigations made on a number of typical German coals at the experimental works of the Association at Carlsruhe have been summarized from this standpoint (*vide* "JOURNAL," July 27, p. 236). The distribution of the calorific value of the coal among the several products of its distillation—coke, gas, and tar—has been shown in the report of those investigations. It appears therefrom that from 21 to 29 per cent. of the heating value of different coals is recoverable in the form of gas. This factor is primarily the most important at the present time in settling the choice of gas coals, though other considerations must, as already mentioned, not be disregarded. Bearing in mind the change in the standard or conditions of assessment of the value of gas coals which has been brought about by the passing away of the illuminating power test and the altered methods of carbonization, it appears that the class of gas coals will be considerably extended so as to include descriptions which have hitherto not been regarded as falling within it. In vertical retorts and large chamber ovens, usable coke and gas of standard quality can be obtained from varieties of coal which could not be used in the old types of retort-settings. Investigations at the experimental works of the German Association will be directed to comparing the coals commonly used in German gas-works with a view to throwing further light on this matter.

At the conclusion of Professor Bunte's address, Professor H. Strache, of Vienna, made some lengthy remarks deprecating the acceptance at the present stage of any minimum limit of calorific power by the gas industry. These remarks have already been reported pretty fully in the "JOURNAL" (*vide* Vol. CVI., p. 968). Professor Bunte, in acknowledging them stated that his views did not really conflict with those of Professor Strache, who had only extended them somewhat in regard to the application of water gas. He (Professor Bunte) had expressly excluded the future developments, which Professor Strache had in mind, from consideration; and it was not his wish to fetter the industry in regard to the quality of gas to be supplied. The propositions put forward were intended only to serve as a basis from which deviations upwards or downwards could be sanctioned, according to the circumstances. But caution should be exercised in assessing gas otherwise than according to its calorific power, and in claiming special advantages for the poorer qualities, even though they gave a comparatively good duty with the burners at present in common use. In regard to the relation subsisting between calorific power and illuminating power in the incandescent gas-burner, it was not pretended that this relation took the form of a definite law. It presented only a very useful rule, which might be of service just as Dulong's rule for ascertaining the calorific power of coals had been of great use before any practically available calorimeter had been devised.

GASEOUS EXPLOSIONS.

Second Report of the British Association Committee.

(*Concluded from* p. 768.)

III.—Explosion Experiments.

Much light has been thrown on the chemical processes in such explosions as occur in the gas-engine by a very complete study made by Dr. Watson of the thermal and combustion efficiency in a petrol motor.* Such a motor, on account of its high speed, is well suited for the investigation of this question. In some of Dr. Watson's experiments, as little as 1-50th of a second elapsed between the ignition of the mixture of petrol and air and the discharge of exhaust gases. The most important part of Watson's work, from the point of view of the Committee, is the simultaneous measurement which he has made of the quantities of air and of petrol taken into the engine and of the chemical composition of the exhaust gases.

Several observers have found that even when the combustion in the petrol-engine is apparently perfect, there being some excess of oxygen and no carbon monoxide or hydrogen in the exhaust, the ratio of hydrogen to carbon in the exhaust gases is considerably greater than in the petrol used—showing that even in this case there must be some incomplete combustion.† The very complete set of analyses taken by Dr. Watson (of which he was good enough to give full particulars to the Committee in Note No. 7, before his paper was published) bear out this observation, and show that the discrepancy between the composition of the exhaust gases determined in this way and that of the petrol is not due to errors of experiment.

Some evidence as to the cause of the discrepancy is furnished by the experiments of Hopkinson, who found that by exploding the residue of the exhaust, after absorbing carbon monoxide and hydrogen, with electrolytic gas, a considerable further yield of carbon dioxide, amounting to nearly 5 per cent., was obtained. Hopkinson also found that the residual combustible gas revealed in this way was soluble in water, which points to the possibility that it may be an aldehyde, or possibly acetylene. It is known that in the combustion of hydrocarbons, such as petrol, with insufficient oxygen, considerable quantities of aldehyde are formed; but, so far as the Committee are aware, the question has not been fully investigated where sufficient oxygen is present to burn the petrol. It is at least possible that the effect may be due to deficient vaporization or incomplete mixture in the combustion as it occurs in the petrol engine, and that it would not happen if the petrol were completely converted into vapour, and that vapour sufficiently intimately mixed with the air before combustion took place. Professor Bone, however, considers that the combustion of a hydrocarbon with insufficient oxygen is not different as to chemical actions from combustion with excess oxygen; and he dissents from the view that the effect observed may be due to deficient vaporization or incomplete mixture. The question is one well worthy of the attention of those chemists who are engaged in the study of the combustion of hydrocarbons. Whatever the explanation, the practical result established by these experiments of Watson and Hopkinson is that the petrol is rarely, if ever, completely burnt in a motor fed by the ordinary types of carburettor, even when there is apparently considerable excess of oxygen.

Neither Watson's nor Hopkinson's experiments, which are in full agreement with one another, suggest that the incomplete combustion occurring in the petrol motor is conditioned in any way by the speed of revolution. It is probable, therefore, that it is not incomplete combustion of the kind contemplated by the Committee and referred to in their first report, such as may be caused by the action of the cold walls of an explosion vessel in which a truly homogeneous mixture is exploded.‡

Some light is thrown on this question by some experiments made by Dugald Clerk during the year under review, who has exploded mixtures of coal gas and air in an apparatus consisting of a cylinder containing a piston which could overrun a port at the end of the stroke. The cylinder was charged with a mixture of gas and air; the piston being placed so that the port was closed, and sufficient time was allowed for complete diffusion to take place. The mixture which was at atmospheric pressure and temperature was then fired, the pressure generated forced out the piston, which opened the port at a period varying from 0·11 to 0·23 second from the moment of explosion; thus liberating the gases. The gases escaped through the port and through a passage packed with cold wire gauze by way of a small slide-valve into a collapsed gas-bag. The gauze checked any chemical action going on in the gases, which were subsequently removed from the bag into which they had been exhausted, and analyzed. In each of eight experiments, three of which were made with a mixture of 1 volume of coal gas to 7 volumes of air, and five with a 1 in 10 mixture, a certain proportion of unburnt fuel was found in the exhaust. The quantity of carbon ranged from 2 to 4·3 per cent. by volume, and the quantity of hydrogen 0·8 to 3·7 per cent. by volume. These experiments seem to prove that from some cause combustion, even in the explosion of a strong mixture, continues some little time after attaining maximum pressure.

In the petrol-motor as ordinarily used, the air is insufficient to burn the petrol completely. Under these conditions, the efficiency of the engine, reckoned on the actual consumption of petrol, is, of course, much reduced, since the exhaust contains carbon monoxide and other substances of considerable heating value. Hopkinson and Morse, however, pointed out two years ago that if the efficiency were calculated on the heating value of the chemical changes which actually took place in the engine, it remained nearly constant over a wide range of mixture strength as was to be expected from theory. The effect of mixture strength on the efficiency of a petrol-motor has been exhaustively investigated by Watson during the past year. Some of his results are given in the following table:—

Air / Petrol by Weight.	Indicated Thermal Efficiency Calculated on		
	Whole Calorific Value of Fuel.	Calorific Value Corresponding to the Chemical Changes which Actually Take Place.	Percentage of Heat of Fuel Liberated.
14	0·248	0·251	99
13	0·235	0·264	89
12	0·220	0·278	79
11	0·204	0·287	71
10	0·185	0·289	64

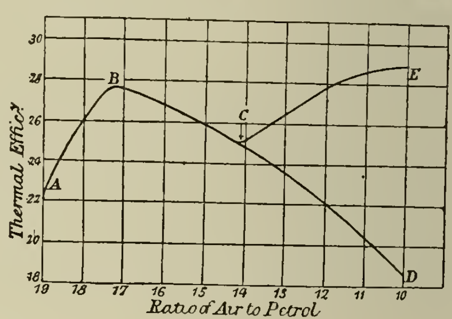


Fig. 3.

The curves, fig. 3, show the change of thermal efficiency with ratio of air and petrol by weight, beginning with a mixture having so little petrol as 1 part by weight to 19 parts by weight of air up to 1 part petrol to 10 parts air. The efficiency rises from A to B and falls from B to D. The line C to E starting from the point C on B D gives the efficiencies calculated on the basis of the heat liberated during the chemical changes which actually occur. The efficiency rises from point A to point B; the lower efficiency at point A being due to slow inflammation of the mixture for the speed of the engine, so that burning is continued after the constant volume phase is passed. B is the point of maximum efficiency; but it does not appear to be the point of maximum chemical combination. The most complete chemical combination is found at the point C. The fall of efficiency is doubtless due to the continually increasing flame temperature between B and C—that is, between a mixture of 1 part by weight of petrol to 17·3 parts of air and 1 of petrol to 14 of air. The increasing flame temperature with the richer mixture increases the heat loss and also the mean specific heat of the gases over the range of the temperature used, and so efficiency is diminished from both causes. From C to D the petrol is in excess; and hence the flame temperature must, on the whole, be falling. At the point D a very large quantity, however, of the fuel is being discharged incompletely burned, as only 64 per cent. of the heat of the fuel is liberated. Calculating, however, the line C E, which is the line giving the thermal efficiency of the engine for the chemical action actually completed, it is somewhat surprising and interesting to find how greatly the efficiency increases. With 1 of petrol to 10 of air, it rises as high as 0·289. For these tests the air standard efficiency was 0·46, so that the efficiency ratio was 0·64—an extremely high efficiency for so small an engine.*

This increase in efficiency is to be ascribed mainly to the reduction of flame temperature—much as in Dugald Clerk's supercompression experiments. A small increase is also to be expected

* Proc. Inst. Automobile Engineers, May, 1909.

† Hopkinson, "Engineering," Aug. 9, 1907; Clerk, Proc. Inst. Automobile Engineers, December, 1907; Hopkinson, *Ibid*, February, 1909.

‡ Professor Bone writes: "I am not in the least surprised that Dr. Watson has obtained evidence of some disappearance of carbon (as a soluble product) in his experiments; indeed, I should have been rather surprised if he had not obtained such evidence. Some years ago, working on the combustion of dense hydrocarbons in a Diesel engine, I found a considerable 'disappearance' of both carbon and hydrogen, which was at once explained when the water condensed from the exhaust gases was found to give a very strong aldehydic reaction."

* The portion C E of the curve is calculated by deducting from the calorific value of the petrol the heat which would be liberated if the CO, H, and CH_4 in the exhaust were burnt to CO_2 and H_2O. There is some uncertainty in the result, because there is undoubtedly some combustible matter in the exhaust which is not accounted for in the analyses. Moreover, in Dr. Watson's experiments the H and CH_4 were not directly measured, but were calculated by means of an empirical formula from the measured quantity of CO. Hopkinson and Morse worked out the heat developed by burning the oxygen present to CO, CO_2, and H_2O in the proportions found in the exhaust. The result obtained is rather different from that calculated by Watson's method; and this may account for the fact that Hopkinson found a smaller increase in efficiency with richness of charge than did Watson, though the observations on which his calculations were based were in good agreement with Watson's.

from the increase of specific volume which occurs on explosion, and which may amount to as much as 10 per cent. volume in extreme cases. Though this volume change is insignificant compared with that occurring in explosions of solids like gunpowder and cordite, yet it should strictly be included in calculations of thermal efficiency. It tends to make the efficiency of a petrol-engine rather greater than that of a gas-engine, in which the compression and heat supply per cubic foot are the same.

Radiation in Gaseous Explosions.

The importance of radiation in its bearing upon the calculation of volumetric heats from explosion pressures was pointed out in the first report. It is probable that the loss of heat from this cause, or at any rate that part of it which occurs during the progress of the flame, is independent of the size or surface area of the vessel, and cannot, therefore, be allowed for by a comparison of vessels of different sizes. Any considerable amount of radiation of this character will seriously affect the values of the volumetric heat obtained by explosion experiments.

Hopkinson has been investigating this question, and has made some progress during the year. He gives some of his results in Note No. 10. It will be remembered that at the meeting of the British Association in Dublin he described the results of some experiments which he had made dealing with the effect upon explosion pressures of the nature of the surface of the vessel. He coated the inside of the explosion vessel with tinfoil, and compared the results of exploding identical mixtures, first with the tinfoil brightly polished, and secondly when it was covered with lampblack. He found that the difference in maximum pressure was inappreciable, but that the rate of fall of pressure during cooling was considerably less with the bright than with the dark lining. This is in accordance with observations which have been made upon the effect of polishing the interior of the combustion space of a gas-engine, which has been found to result in a perceptible increase in mean pressure.

During the year, Hopkinson and his pupils have been carrying out further investigations on this subject. The results described in the last paragraph have been fully confirmed, and direct bolometric measurements have also been made of the radiation in an explosion. For this purpose a small portion of the surface of the explosion vessel was covered with thin copper strip, and the rise of resistance of this strip during the explosion was recorded by means of a quick-period reflecting galvanometer; a record of the pressure being taken at the same time. Comparative experiments were made, first with the strip polished as highly as possible, secondly with it blackened over, and thirdly after it had been protected from direct contact with the flame by means of a plate of rock-salt fixed in front of it. It was found that the rate of rise of temperature of the blackened strip during combustion and the early stages of cooling greatly exceeded that of the polished strip, and that the difference between them was roughly the same as the rate of rise of temperature of the strip protected by rock-salt. It appeared that the amount of heat lost to the walls of the vessel by radiation up to the moment of maximum pressure was, with a 15 per cent. mixture by volume of coal gas and air giving a maximum temperature of 2150° C., of the order of 5 per cent. of the whole heat of combustion; and there was evidence that the radiation continued for some considerable time after maximum pressure, until the temperature of the gas had fallen to 1400° C. The experiments are not yet sufficiently advanced to give a quantitative basis for the correction of volumetric heats obtained by explosion experiments; but Hopkinson considers they establish the fact of a material amount of radiation at the moment of maximum pressure and during the first stages of cooling.

Apart from their bearing on the determination of volumetric heats, these results, if fully confirmed and proved to be due to radiation, and not to differences in roughness of surfaces or other secondary causes, will raise interesting questions as to the origin of the radiation and as to the state of the gas at the moment of maximum pressure. Comparing the two explosions, one with the bright and the other with the blackened lining, it seems to be established that the maximum pressure and maximum temperature are the same. On the other hand, the experiment with the bolometer would seem to show that more heat has been lost in the one case than in the other; and therefore the energy of the gas enclosed with the bright lining is greater than that of the gas enclosed in the blackened lining, though the temperatures are the same. If this be the fact, there must be some want of equilibrium at this moment. Many chemists, including Bunsen and Professors Smithells and Dixon, have upheld the opinion that radiation from a gas, at any rate at temperatures such as can be obtained in an explosion, can only go on as a result of some sort of chemical or *quasi*-chemical action. According to this view, the want of equilibrium at the moment of maximum pressure must be due to incomplete combustion, and the continuing radiation after maximum pressure must be regarded as evidence of continued chemical action. This view as to the radiation from a gas is, however, not generally accepted; and the existence of radiation, therefore, cannot be regarded as conclusive evidence of continued combustion. If it be assumed that combustion is complete at the moment of maximum pressure, or very shortly after it, then the want of equilibrium at this moment disclosed by the experiments must be ascribed to purely thermal causes. The most obvious explanation in such a case would be that the translational and vibrational energies of the molecules have not attained their equilibrium proportion. Since the temperatures in the two explosions with bright and blackened linings are the same, the translational energies, which alone determine temperatures, must also be the same. It is conceivable, however, that the energy represented by rotation or vibration of the molecules may be greater in one case than in the other.

Measurement of Temperature.

In the first report, the importance of dissociation in connection with the gas scale of temperatures, which is the only scale at present available for explosion and gas-engine experiments, was pointed out, and a hope was expressed that an investigation of dissociation from this point of view might be undertaken by the National Physical Laboratory. The Committee are glad to be able to report that Dr. Glazebrook has given his sanction to such an investigation, which is now being carried on under the immediate superintendence of Dr. Harker; and that Dr. Glazebrook has shown his personal interest in this and the other matters engaging the attention of the Committee by joining them as a member.

The main object of the high-temperature research work which is now in progress at the National Physical Laboratory is to obtain direct gas thermometer measurements up to 1700° C. or 1800° C.; and it is to this object that Dr. Harker's efforts are being directed. On this inquiry, the question as to the amount of dissociation present in the measuring gas has an important bearing, and may properly be included in high-temperature research.

In order, therefore, to have the facts in a form for discussion, Dr. Harker prepared a note on the early work on dissociation, particularly the experiments of Grove and of Deville. [This note is printed in full in an appendix.] In view of the discrepancy which is apparent from the account given in this appendix between the statements of Deville on the one hand and the recent work of Nernst and Wartenberg (which has been confirmed by Holt) on the other, as to the actual amount of dissociation in steam, carbon monoxide and carbon dioxide, particularly at low temperatures, it seemed of interest to ascertain if light might not be thrown on the question by a simple repetition of one or two of Deville's fundamental experiments. Apparatus for this purpose has, therefore, been set up at the National Physical Laboratory, and was shown to the Committee on the occasion of their recent meeting at the Laboratory by invitation of Dr. Glazebrook. The methods and apparatus for the purification and the heat treatment of the materials used in the preparation of very refractory vessels were also explained.

Sir William Preece was especially impressed with the necessity of repeating this early work; and, accordingly, the Committee welcome the installation of Deville's experiments under modern conditions and with modern appliances for the accurate measurement of temperature which were unavailable in Deville's time.*

Measurement of Pressure.

It was pointed out in the first report that the determination of the energy function depended upon the measurement of the temperature of the gas experimented with, and that two methods had been used. According to one method, the gases themselves, which are within the engine cylinder or the explosion vessel, are utilized as the thermometric fluid; and according to the other method, the gas temperatures have been measured by a thermocouple or a platinum resistance thermometer. The first method of measurement by pressure changes necessitates the use of accurate indicators. In gaseous explosions, pressures and temperatures before ignition are comparatively easily determined, but pressures after ignition are often difficult of determination for purely mechanical reasons. The Committee are of opinion that for accurate work in gaseous explosions optical indicators offer marked advantages, and they recommend that in all investigations depending upon the use of such indicators the oscillation period of the indicator should be given. In the piston indicators used by Clerk and Hopkinson, this period is very easily determined. [The Committee give a photographic reproduction of an optical diagram taken by the Clerk indicator to determine the period of the instrument used for the experiments described in Note No. 11. In this indicator the oscillation period is 1-216th of a second. With a light spring diagram, shown in another figure, the period is 1-108th of a second—double the period of the other. To make certain that the indicator registered maximum pressure correctly, the piston was held up by a movable stop, so that the spring was compressed to within a few pounds of the maximum pressure. The first compression line is, therefore, omitted from a diagram produced in this way until nearing the maximum compression. The piston is then lifted from its stop whenever the pressure exceeds that put upon the spring by the stop, and the maximum pressure is indicated avoiding the momentum effect which causes the piston to tend to overrun its true pressure. This is clearly shown in another figure. A number of diagrams taken proved that the maximum pressure obtained with the stop in and with the stop out was the same.]

Oscillation-period experiments and experiments with a stop are recommended to determine the accuracy and sensitiveness of piston-operated indicators. Careful comparisons made by Professor Burstall and Professor Hopkinson of the Hopkinson optical

* Professors Smithells and Bone doubt the relevance of experiment according to Deville's methods to the question of flame temperature; though they welcome the proposed experiments from the purely scientific point of view.

and a specially-selected Crosby mechanical indicator proved that the mechanical indicator gave maximum pressures differing considerably from the optical indicator, except when the ignition was very slow, though the mean pressure was nearly the same. Experiments made by Clerk with another mechanical indicator compared with a Clerk optical instrument, showed deviations exceeding 5 per cent. in maximum pressures.

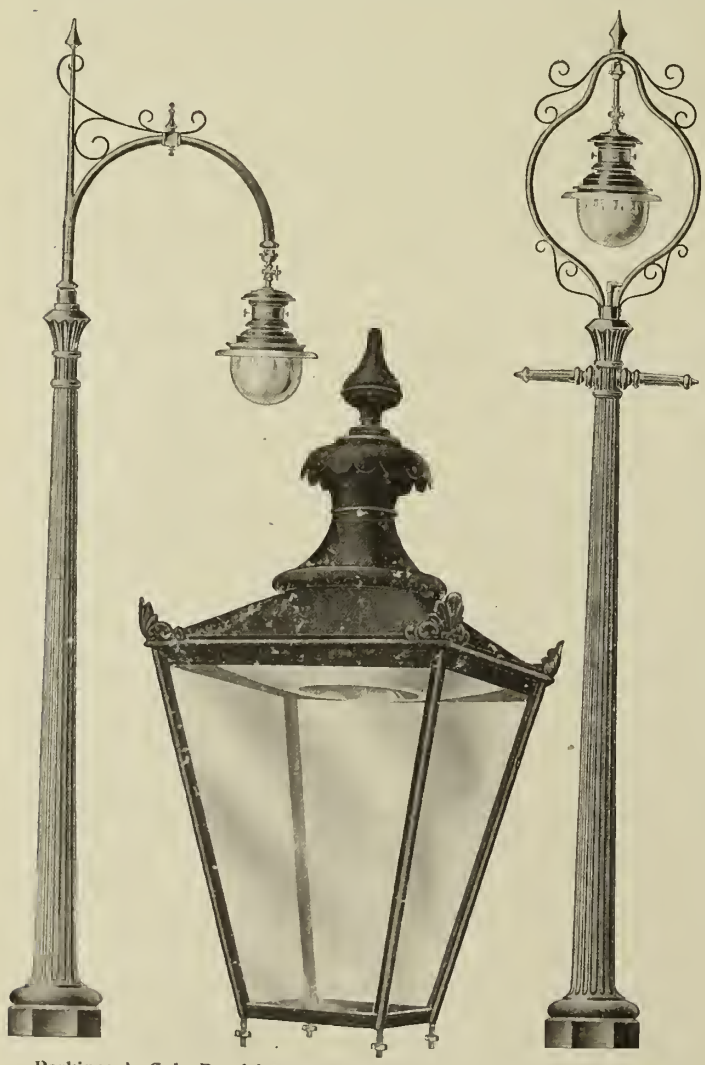
As showing the importance of temperature measurement in gaseous explosions, the Committee would refer to diagrams obtained by Callendar and Dalby, described in Dalby's Note No. 12. These diagrams showed a maximum temperature of 2500° C. of the gas and air mixture in a gas-engine cylinder—a temperature about 300° C. higher than any temperature obtained by ignition from atmospheric pressure. Professor Dalby is continuing his investigations, and many interesting points can be determined by his method of experimenting. The question of dissociation is directly affected by the possibility of getting temperatures of 2500° C. with any gas and air mixture whatever.

The Committee consider that their continued work will prove useful, and they therefore recommend that they be re-appointed, and ask for a further grant of £100. The Dublin grant has been carefully expended.

The report is followed by the two appendices referred to in it.

NEW STREET-LAMP DESIGNS.

This season, Messrs. Parkinson and W. & B. Cowan, Limited, have given special attention to lamps for inverted street lighting; and they are listing an inverted "arc" lamp, as illustrated, which is constructed of green enamelled steel, or all copper. It is made in three sizes—two, three, and four light. The notable features of this lamp are: All air-inlets of the burners are protected from the escaping products of combustion. Each burner is fitted with a gas and air adjuster, which can be operated from the outside. The burners are made of best brass, with magnesia



Parkinson's Gale-Proof Lantern and Inverted "Arc" Street-Lamps.

nozzle, and fitted with dual fittings (a patent for which has been applied for), with two sets of projections to carry any description of inverted mantle. They are wind, rain, and dust proof; British made; and inexpensive, but reliable. In their list, the firm give illustrations showing different methods of fixing the lamp on existing columns; and the effect is graceful and pleasing.

Messrs. Parkinson and Cowan have also added to their list a new pattern lantern of neat design—namely, the "Parkinson No. 870 Gale-Proof," which they claim to be wind and rain proof. This new lantern has been carefully thought-out to meet present-day requirements, and tested on their testing tower—being exposed to all kinds of weather. They have also greatly strengthened all the "Parkinson" series of lanterns, and lengthened the bodies, giving to the lamp a more graceful appearance. The No. 801 "Storm-Proof" lanterns still remain one of their most popular patterns; large quantities of them having been sold to sea-coast towns, where they are exposed to stormy weather. Every class of brasswork for street lighting is also manufactured by them, among which is the No. 9 anti-vibrator, which can be had fitted with almost any type of upright incandescent burner, and provides for both lateral and vertical vibration.

REGISTER OF PATENTS.

Geysers.

Barralet, T. E., of East Finchley, N.

No. 17,697; Aug. 22, 1908.

This invention has for its object to provide means for increasing the heat efficiency of geysers, and also simple means for collecting the fluid of condensation from the hot gases from the burners.

The geyser is made with chambers or jackets through which the water passes, and the exterior surfaces of which are exposed to contact with the heated gases, or with surfaces in contact with the gases and over which the water to be heated passes. To increase the heating value of these surfaces, there is applied thereto a special arrangement of heat conductors—that is to say, heat-conducting media in the form of spirals or coils of wire or metal strip fitted in grooves formed, or provided, in the heating surfaces in such a manner that each convolution of the spiral is in contact with the surface at preferably one point only; the remainder of each convolution being exposed to contact with the hot products of combustion from the burner. Thus, in practice, the spirals or coils may be arranged with their axes at right angles to the path of the hot products of combustion, in which case the gaseous products would pass through the spaces between the convolutions or turns of the spirals; their heat being thereby more rapidly absorbed by the convolutions owing to their division into small streams or currents. Or the spirals or coils may be arranged with their axes in the direction of the flow of the heated gases, in which case the latter would be split up or divided into streams by passing inside and outside the spirals.

The heat absorbed by the spirals from the hot gases is at once conveyed by conduction to the heating surface to which the spirals are fitted, and, owing to this rapid conduction, and also to the fact that each convolution of the spiral absorbs only a small quantity of the total heat yielded up by the hot gases, the coils are not liable to burn.

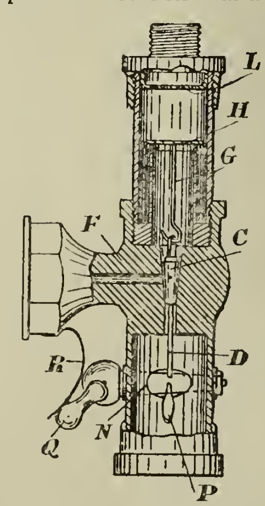
In order to prevent the fluid of condensation which collects upon the interior water-jacket from dropping on to the burner or burners, the upper edges of a perforated plate are attached to the bottom of the water-jacket, while the lower edges are in contact with, and preferably fixed to, the jacket forming the outside body of the geyser. Thus any condensation on the inner water-jacket runs down the inclined plates to the outside jacket, down which it flows and from which it can be easily collected and discharged at the base of the apparatus.

Safety Device for Automatic Gas-Meters.

Winter, T., of Kensal Green, N.W.

No. 18,097; Aug. 28, 1908.

This invention relates to a safety device for meters of the class in which means are provided which, when the gas supply runs out, automatically close the pipe leading from the meter, so that, notwithstanding the supply being renewed, the gas is prevented passing until the valve is voluntarily opened. It consists in arranging in the exit pipe a



Winter's Automatic Meter Cut-Off.

valve comprising a tapered conical seating and a conical plug fitting therein; the plug being mounted with a certain amount of play upon a vertical pin carrying at its upper extremity a cylindrical cap, closed at the top and open at the bottom—the cap working in a gas-tight cylindrical casing.

On the exit pipe leading from the meter is a conical valve seating, with a conical plug C provided at its lower end with an extension or pin D passing through an orifice in the body of the carrier F. At its

upper extremity the plug is attached to a vertical pin G connected to a cylindrical cap H (closed at the top and open at the bottom) encased in a gas-tight cylinder screwed into a socket-piece or neck of the body F. The casing is made with a perforated top L, to allow the gas to percolate through as it emerges through the valve C and rises around the cylinder H on its passage to the fittings.

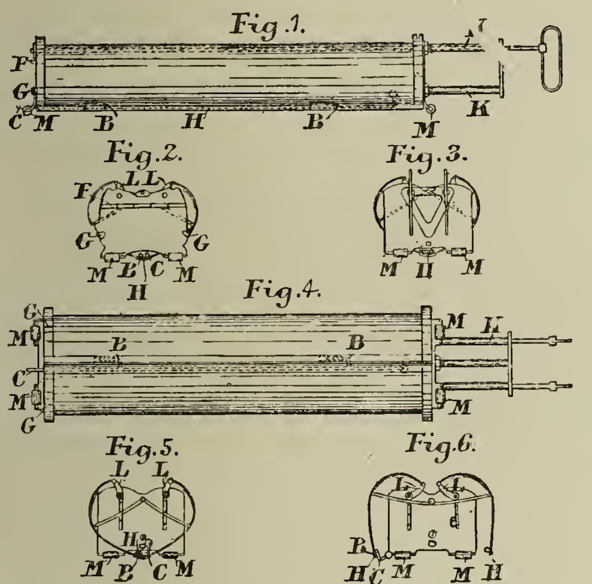
In operation, the pressure of gas, acting upon the cap H, maintains the plug C in its raised position, permitting the gas to pass; but as soon as the pressure is reduced or ceases, by reason of the supply of gas being consumed, the plug drops on to its seating and prevents any further passage of gas (when resupplied), as the pressure of the latter will not be sufficient, or acting in the proper direction, to lift the plug without an initial start. To give it this initial start, when required, a transverse arm N is fitted across an extension of the body F below the gas supply. The arm is provided with a small disc or lever P, which, when the arm is turned by (say) the handle Q, comes into contact with the end of the extension or pin D of the valve and lifts it, thereby giving it the initial start and maintaining the valve in the raised position so long as there is any pressure of gas acting against it. A spring R may be arranged to retain the valve-releasing arm N in the inoperative position.

Scoop for Charging Gas-Retorts.

Bird, H., of Hornsey, N.

No. 18,334; Sept. 1, 1908.

This invention relates to the charging of gas-retorts with coal; and in accordance with it, the patentee provides a scoop which, filled with coal, is inserted in the retort and there automatically discharged of its contents, so that the retort (whatever its capacity) is fed with sufficient coal at one operation.



Bird's Retort-Charging Scoop.

Fig. 1 illustrates the scoop in side elevational view. Fig. 2 is a view of the front end; and fig. 3 is a similar view of the rear end of the scoop. Fig. 4 is a plan; and figs. 5 and 6 are cross sections showing the scoop in the closed and open positions.

The scoop is formed with an open top, and is divided into two halves longitudinally along the centre line of the bottom; the two sides being hinged to the extremities of the levers L at the top and held together by bolts B at the bottom, which are operated from a bar C extending the full length of the scoop and projecting a slight distance beyond the front end. Both ends are closed; the front end being hinged at F and kept closed by a spring or catch G.

When the scoop is pushed into the retort, the protruding end of the bar C, upon coming into contact with the end wall, slides back and releases the bolts B, and the weight of the coal contained in the scoop then forces apart the meeting edges H of the two sides of the scoop and forms an opening through which the coal falls.

Handles connected to rods, taking bearings in the two end walls of the scoop and in an extended framework or bracket K formed at the rear end of the scoop, are provided, and which handles, connected by the levers L to the sides of the scoop, permit of it being opened or of the sides being shaken by hand when required, after the bolts have been released.

Wheels M, on the ends of the scoop, travel upon a track provided within the retort, so as to facilitate the insertion and withdrawal of the scoops.

Incandescent Gas-Lamps.

Cody, R. D., of London, Ontario, Canada.

No. 25,428; Nov. 25, 1908.

This invention relates to gas-lamps in which are employed several inverted incandescent burners depending from a chamber supplied by a mixing-tube with the mixed gases for consumption—in some cases the burners, chamber, and mixing-tube being adjustable in relation to the gas supply pipe. The object of the invention is to simplify the construction of such lamps, to provide means whereby a more perfect mixing of the gas and air is effected, and the passage of gas from the supply pipe to the mixing-tube controlled, and to provide ready means for assembling and disassembling the parts of the lamps so as to facilitate packing. In connection with the chamber from which the gas issues to enter the mixing-tube, there is provided a regulating device, and the chamber is arranged on a construction of fitting comprising a link with a hollow portion adapted to conduct the gas from the supply pipe to which the link is secured to the chamber—the chamber being preferably provided with perforations through which gas issues in independent streams or jets to the mixing-tube.

Discharging Machines for Gas-Retorts.

Williams, P. E., of Leytonstone, Essex, and M'Phee, N., of Poplar, E.

No. 18,335; Sept. 1, 1908.

This invention, relating to discharging machines for gas-retorts, &c. —the object being "to improve and simplify the construction, wherein constant pressure rams, internal packings, or pistons, and differential areas under pressure for the object of withdrawing the pusher after making the working stroke are dispensed with"—was fully described and illustrated in last week's "Journal," p. 754.

Purification and Recovery of Tar, &c., from Blast-Furnace Gases.

Neilson, W. C., of Coatbridge, N.B.

No. 28,462; Dec. 31, 1908.

This invention having reference to the purification of, and recovery of tar and other substances from, blast-furnace, producer, and like gases, is essentially a development of patent No. 28,508 of 1904. It has been found in practice in treating gases—especially producer gas where cheap bituminous coal has been used—that the tar is of a sticky or adhesive nature.

Instead therefore of using a washer or tar-extractor with a gauze diaphragm submerged in creosote oil as described in the earlier patent, according to the present improvements the elimination of the pitch, tar, or like substances retained by the gas, is facilitated by transforming the creosote oil or other suitable solvent of the tar into a gaseous vapour before admitting it into the tar-extractor or housing vessel in which the trapping appliances are fitted.

This may be accomplished by leading the oil by an automatic supply from the cistern shown in the 1904 patent into an ordinary construction of boiler with furnace, where the oil would be transformed into a gaseous vapour, which would be taken away by a pipe and admixed with the gas from the producer or blast-furnace before being admitted into the housing chamber where the tar-trapping appliances are fitted. Or a regulated supply of the oil could be fed from the cistern through a syphon or like pipe into a coiled pipe or evaporator located in the ordinary "silencer" attached to the gas-engine exhaust, and then mixed with the producer or other gas in the main leading to the housing chamber, where the tar-trapping appliances are fitted. Or the gas or vapour generated from the creosote or other oil might be led direct to the trap housing chamber before mixing with the producer gas.

The proportions of creosote oil vapour used depend on the temperature of the gas, and therefore of the viscosity of the tar. Thus in ordinary circumstances with the producer gas at a temperature of about 45° Fahr. about 1 part of oil in 7000 parts of gas by weight would be sufficient to reduce the viscosity of the tar. But if the temperature is lowered, the quantity of oil would require to be considerably increased.

Placing Coins in Slot-Meters Out of Reach.

Orchard, G. R., of Bath.

No. 1450; Jan. 21, 1909.

The "patentee" describes an instrument, long arm, or tongs for placing coins in slot gas-meters when out of reach or when placed high up from the ground, formed from a single length of wire bent upon itself to form a spring handle with parallel legs running side by side and at right angles to the handle. The shorter leg works in rings or loops on the longer leg; and the ends of the legs are bent at right angles to their length, and are fashioned into T-shaped jaws for the reception of a coin. An eye, ring, or loop in the shorter leg provides the means for operating the coin handle or wheel of the meter.

Grates of Gas-Producers.

Bone, W. A., of Leeds, and Wheeler, R. V., of Altofts, Yorks.

No. 10,230; May 11, 1909. Ante-dated Oct 29, 1908.

This invention relates to the construction of the conical grates of gas-producers—more particularly to the means for carrying the grate-bars from the lower end of the shell or casing.

The grate-bars are arranged in the usual conical manner—that is, suspended at their upper ends from the bottom of the casing and with their lower ends resting on a ring of a diameter suitably smaller than the diameter of the bottom of the shell. The upper ends of the bars are suspended by a cotter connection; the upper ends either fitting on supporting pins or studs (through which latter the cotters are passed), or passing through holes in an angle iron or other flanged ring. The pins or studs or the angle iron, as the case may be, are secured to the bottom of the cone or casing of the producer.

Colwyn Bay Gas Undertaking.—A special meeting of the Gas Committee of the Colwyn Bay Urban District Council has been held to receive the report of Messrs. T. Newbigging and Son, who were called in by the Council to carry out an investigation in regard to the administration and position of the gas undertaking. It was ordered because the return for last year was unsatisfactory, and an unusually large quantity of gas was unaccounted for. The report has not yet been published; but information as to its nature and conclusions has leaked out. It appears that the gist of the report amounts practically to a censure of the Gas Committee. It is stated that the concern is well equipped, is quite capable of turning out gas economically, and has a good class of paying consumers; and all that is necessary to make a success of it is good administration.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The St. Helens Vertical Retort Results.

SIR,—In the article in the last number of the "JOURNAL," on "Technology as Exemplified by the St. Helens Retorts," Mr. Holgate draws up, in Table II., a balance giving the weights of products obtained per ton of coal distilled, in tests made with the above retorts, and from his calculations concludes that the total weight of products recorded shows a surplus over a ton of from 4 to 10 per cent.

In making up this balance-sheet, Mr. Holgate has been obliged to assume the amount of water produced in the distillation of the coal—this figure not being available in the published information; and his assumption is that the quantity of such water produced was 100 lbs., or 10 gallons less than the yield of 10 oz. liquor per ton. Taking tests Nos. 2 and 3 in Table II., for which I am responsible, this means that he has taken the water yield as 29·6 gallons in the first case and 21·7 gallons in the latter. Such figures would, if true, certainly be very abnormal—especially the former—and in point of fact are much above the actual yield in both instances.

In making the test, the total quantity of virgin liquor, which represents, approximately, the water formed in the distillation, was determined separately; the observed figures being, in No. 2, 13·8 gallons, and in No. 3, 11·9 gallons. The specific gravity was 1·02. Taking these observed figures, in place of Mr. Holgate's estimated ones, the balance-sheet works out as follows (omitting fractions of a pound):—

		Test No. 2. Orrell Nuts.	Test No. 3. Thornley.
Density of gas computed from analysis (H = 1)		5·87	5·42
Weight of gas from 1 ton . .	pounds	358	378
,, dry coke ,, . .	,,	1590	1590
,, tar ,, . .	,,	185	149
,, virgin liquor . .	,,	141	121
Total weight of products . .	,,	2274	2238
Apparent surplus or deficit .	,,	+ 34	− 2

In addition to these factors, other smaller ones ought to be taken into account, if it were possible to make an approximate estimate of them. To the weight of the products should be added that of the gaseous impurities removed in the scrubbers and purifiers, and of any small quantities of gas lost; while to the weight of the coal should be added that of the very small quantity of water evaporated into the gas from the coke-discharging apparatus, and of the nitrogen in the gas not derived from the coal, which items would tend to balance each other.

Taking into consideration the fact that, in a large-scale test of this kind, it is impossible to get figures accurate to a decimal place, I think the revised balance-sheet shows as good a general agreement as could be expected between the weight of the coal and that of the products obtained. The figures given for dry coke may be a little too high, as this depends on the accurate determination of the percentage of moisture in the coke as weighed. As everyone knows who has tried to sample a bulk of 50 tons or more of coke, this is far from being an easy matter; and on the whole the tendency of the error is to give rather too low a figure for the moisture, and in consequence somewhat too high a return for the dry coke.

With regard to Mr. Holgate's calculations of the gross and net calorific powers from the analytical data, it seems to me questionable whether it is advisable to base any very definite conclusions on the results of such calculations, in view of the fact that there are so many points of uncertainty with regard to them. One reason for this Mr. Holgate himself points out—namely, the doubt as to the exact nature and quantities of the constituents classed together as "unsaturated hydrocarbons," and, further, it must be remembered that the difference between the gross and net figures calculated from the analyses will often differ appreciably from that shown by the calorimeter in ordinary practice. For, in calculating the net figure from the analysis, the assumption is made that the whole of the aqueous vapour produced in the combustion is condensed to liquid water, whereas in actual working with the calorimeter this is by no means always the case. When the air passing through the calorimeter during the test only contains a low quantity of moisture, an appreciable amount of the water formed in the combustion passes away with the waste gases, which leave the calorimeter saturated with moisture, and usually at a slightly higher temperature than that of the atmosphere. The amount of such uncondensed water varies from time to time according to the moisture content of the atmosphere and to the proportion of air to gas passing through the calorimeter.

Mr. Holgate rightly points out that the yield of tar from Thornley coal should be 13·3 gallons per ton, and not 12·3 gallons as given in the "JOURNAL" for July 20, 1909. The figure 12·3 crept in through an error in transcription.

1, *Arundel Street, Strand, W.C., Sept.* 24, 1909. HAROLD G. COLMAN.

Manufactured Bitumen.

SIR,—I trust you will allow me to refer further to this matter, as dealt with in the "JOURNAL" for Sept. 14; but inasmuch as tar macadam roads have within the past year become of supreme importance, it incidentally brings one of my products to the front as a staple macadam binder.

I am thoroughly in accord with Mr. J. Walker Smith, the Chief Surveyor of the City of Edinburgh, who is a strong advocate for a standardized tar macadam cement. This gentleman, like the writer, has read "Lunge" with profit; and judging from his very able volume on the subject, has also, like the writer, studied tar distillation practically.

My idea of a durable tar macadam is a road surface of 4½ inches of rolled granite chips; then the melted cement (fluxed Vulco-Bitumen) poured over the grouting so as to fill all the interstices and leave a hot plastic surface to be spread over with very fine granite chips and again rolled. The heat to produce great diffusiveness of the binder is about 300° Fahr. Tar cement used in this way has a much stronger hold upon the mineral aggregate than where it is mixed under heat with the mineral aggregate and then placed *in situ* and rolled.

Of course, the formula can be varied and cheapened by shallower grouting and by sand sprinkled in the interstices between the granite-chips for roads carrying ordinary traffic.

It is quite within the bounds of probability that this scientific treatment of tar products will lead to the standardization of insulating compounds, and of tar macadam cement. If so, it will be a boon to both industries concerned, for the history of portland cement, and its ultimate standardization with its excellent results, warrants this sanguine expectation.

Kingston-on-Thames, Sept. 15, 1909. THOMAS MARRIOTT.

LEGAL INTELLIGENCE.

INJURY TO A GAS-MAIN BY A ROAD-ROLLER.

Damages against the Uttoxeter District Council.

At the Uttoxeter County Court, on the 17th inst., before his Honour Judge RUEGG, K.C., the Uttoxeter District Council were summoned by the Gas Company for £4 15s.—being £1 12s. 7d. for repairs to a gas-main alleged to have been broken by the defendants' steam-roller, and £3 2s. 6d. the estimated cost of the gas lost.

Mr. T. S. WILKINS, who appeared for the Company, stated that on the 30th of March last the tenants in the several cottages in Stone Road were considerably alarmed by an escape of gas. The Company were communicated with, and investigation showed that a large iron pipe, which had been put down so far back as 1879, had been broken in such a way as to cause a considerable escape of gas. No Act of Parliament was obtained originally to sanction the laying of the pipe; and no statutory power was granted to the Company until 1894. The Council had been content to make use of the main, and were, in fact, one of the largest customers of the Company.

Mr. FLINT, who represented the District Council, raised the point as to whether the main had been properly laid, having regard to the traffic.

Evidence having been given as to an escape of gas being detected by a female resident in Stone Road, who stated that on the day named above a steam-roller had been at work and passed her cottage in the morning, also that timber carts had often gone up the road,

Mr. *William Murray*, the Engineer and Manager to the Gas Company, said he remembered assisting at the laying of the main in Stone Road in 1879. It was a 2-inch cast-iron pipe, about ⅜-inch thick, and was new when put in. The new main was laid at a depth of 17 inches. This was quite sufficient, considering the state of the ground, which was solid gravel. Witness saw a piece of the broken pipe, which showed a clean fracture.

In answer to Mr. FLINT, witness said Mr. Marshall, the Surveyor to the District Council, had told him that a 10-ton steam-roller had been at work on the road. The quantity of gas lost was 25,000 cubic feet; and the escape was of a very dangerous character. He knew that 2 ft. 6 in. was the stipulated depth to lay a main in most towns; but that it all depended upon the nature of the ground. The length of life of a gas-pipe was 70 or 80 years.

Leonard Murray, son of the last witness, corroborated his father's statement; and *Edward Cheery* spoke to repairing the damaged main.

Mr. FLINT contended that the pipe was not at a reasonable depth, and that there had been other heavy traffic on the road in addition to the steam-roller.

Mr. *R. W. Marshall*, the District Surveyor, said that in March this year Stone Road was remetalled with granite, and a 10-ton steam-roller was used. The recognized depth to lay a gas-main was 2 ft. 6 in., and he had never found any pipes laid at a less depth than this.

Mr. *Rist*, the Assistant-Surveyor, said he did not consider the depth of the gas-main sufficient for ordinary traffic.

His HONOUR remarked that it depended on what was meant by ordinary traffic.

Witness said he meant such as steam-rollers and traction-engines.

Other evidence having been given as to the insufficiency of the depth of the main,

His HONOUR gave judgment for the plaintiffs, on the ground that the main was laid at a sufficient depth to meet the needs of the case at the time.

Mr. FLINT asked for leave to appeal if instructed.

This was granted, and costs were allowed.

Theft from the Chester Gas Company.

At the Chester Police Court, last Wednesday, a young man named William Youd was charged with stealing £5 10s. 4d. from the Chester Gas Company. Mr. T. B. Mason, who prosecuted, said the defendant was a collector in the service of the Company, and had made restitution of the money. Mr. F. A. Pye, the Secretary and General Manager of the Company, said he had gone through the books and found that the defendant had misappropriated the above-named amount. He had been in charge of the collecting from penny-in-the-slot meters, and had given receipts, but had not brought the money to the office. He had been in receipt of £90 a year, and had been in the employ of the Company for ten or eleven years. Mr. R. T. Morgan, for the defence, made a strong appeal for leniency, as the defendant to a large extent supported his widowed mother. He urged that the charge might be withdrawn, or that no conviction should be recorded. Accused was bound over for twelve months to come up for judgment if called upon—himself in £10, and two sureties of £5 each.

MISCELLANEOUS NEWS.

PROMOTERS' VICTIMS IN CONFERENCE.

Counsel's Opinion to be Taken.

Convened by Mr. C. S. Glover, himself a shareholder, the shareholders in the Ticehurst and District Water and Gas Company held a meeting last Tuesday, at the Westminster Palace Hotel, to consider their position in that capacity. The proceedings at the meeting further disclosed the methods of Mr. Eaton and his associates in their treatment of those who sink money in their promotions; and they also showed that Eaton and Co. are not held in very high esteem by those who have been induced, by plausible prospectuses, to part with their money. Mr. Glover (whose only interest in the matter is that of an injured investor) presided.

The Chairman said he had called the meeting so that those who were interested in the Ticehurst and District Water and Gas Company, either as share or debenture holders who were not disposed to lose their money, might decide upon a course of procedure for their mutual benefit. The circular-letter the shareholders had received informed them of facts with which they were probably not familiar; and he thought they were sufficient to enlist the support of all those who had found money for this concern in making an attempt to either obtain restitution or the control of the property, which should no longer be left to those who were not elected by the shareholders—those whose interests were inimcal to those of the shareholders. There was quite enough evidence of the omissions of the Directors, their unbusinesslike conduct, and their evident desire to shield the promoters, to satisfy everyone that the shareholders' interests had been sacrificed, and made subservient to those of the promoters and contractors, who had had over £34,356 of public money, and almost the entire capital of the Company. Some £67,000 had been expended; and the Directors would not, and indeed refused to, give an account of what had become of it. In his opinion, it amounted to a public scandal that the promoters and their nominees—self-elected Directors of this concern—should be allowed to defy the shareholders, and refuse for over four years to submit accounts to those who were entitled to intervene. But knowing the delay by petitioning the Board of Trade, it seemed preferable that shareholders and debenture holders should collectively combine. To this end, he had asked the shareholders to meet that day; and with the information disclosed in the circular, he thought they would agree that some immediate action was desirable. They must, however, act cautiously, and have expert advice as to the best course to pursue for their mutual interests. He had his own views, but desired to have the co-operation and assent of his fellow-shareholders, so that all might benefit by the action to be taken, and so there should be no individual preference or advantage. He had taken up the matter, and, having plenty of leisure, intended to see it through to a successful issue, which, of course, would be more complete if supported by the independent shareholders who had a care for the money with which they had parted. If anyone had troubled to visit the gas and water works, they would have been impressed with the absurdity of the whole scheme, and still more with the raising of no less than £67,000 in shares and debentures, the greater portion of which money had been paid to enrich contractors of no financial standing. The meeting and the letters of those who had written to him expressing their thanks for the championing of the cause were evidence of the majority being in favour of the course he suggested. Those present would be asked to approve of resolutions expressing their intentions and their wishes being carried into effect. He did not want to occupy time in detailing other facts that had come to his knowledge; what he had written he believed was sufficient to warrant the removal of the present Directors—viz., William Bentham Martin, Dr. William R. White, and A. W. Lunt—who were not appointed by the shareholders, whose interest appeared to be represented by a very few shares, and who, he believed, had received considerable sums for fees, and, if he was rightly informed, had participated in the promoters' profits. He could not conceive, under the circumstances, any persons of gentlemanly feeling desiring to retain control of the Company's affairs; and, if these Directors would not resign, they must be removed. They should be no longer allowed to retain a position which was not to the interest of the shareholders. Indeed, he was advised that the issue of the prospectuses inviting capital was legally misleading, and that the Directors were responsible to the shareholders for any loss they might suffer. No dividend had been paid to the shareholders. He had not received any since he parted with £350 in 1903. It might be said, "but the interest on the debentures has been paid." This was not evidence of a solvent business, nor that the revenue had justified the payment. There was no profit from running this curious concern. The interest on the debentures was simply a return of the shareholders' money. For this purpose further issues were from time to time made; and those who had had the interest apparently did not trouble as to whence it came.

Mr. W. Alberte said there had been no meeting of the shareholders called since 1904, nor during the same period had any accounts been submitted. In the last accounts exception was taken by the Auditors to a large number of items for which they were unable to vouch, seeing that vouchers for considerable sums of money were not produced, and the revenue account was in a chaotic state. There had been communications with Messrs. Keen and Co. and Messrs. Saker and Davis, who had been asked to have the audit completed; but they had been unable to comply. The Auditors had been defied by the Directors; and no information could be obtained as to the £60,000 odd the shareholders and debenture holders had in all provided. In response to his circular, Mr. Glover had received a large amount of correspondence, representing something like four-fifths of the whole of the capital of the Company, which showed that he had the support of a large majority of the shareholders. Some of the letters were heartrending. Certain of the shareholders—such as postmen and labourers—had put the whole of their savings in the Company; and there was nothing between them and the workhouse. Some steps should be taken to bring retribution to these particular promoters. One gentleman—who was 75 years of age—suggested that steps should be taken to bring the matter before the Public Prosecutor. Another gentleman who was a small shareholder, holding £50 of shares, also said he should like to see the Public Prosecutor take up the matter, and those responsible punished. During the past five years, shareholders had received no less than seven letters from the Secretary, stating that the accounts were being audited, and that it was hoped soon to clear up the matter. As late as Aug. 25, a letter was received, saying the accounts had been thoroughly looked into by the Auditors, and that it had been thought best to bring them up to the end of last year. It seemed pretty clear there was no intention to render an account at all.

Mr. A. J. Rutter remarked that he had persuaded his daughter to invest £30 in the Company, and he himself had invested £50. He took over his daughter's holding, but had had the greatest difficulty in regard to the transfer. He had found Eaton was not a member of the Institution of Civil Engineers, though he called himself "C.E."

Mr. Hooper said he had been a shareholder in the Amman Valley and Laindon Companies, which were promoted under the same auspices; and so he had had unpleasant experiences before this with Eaton and his colleagues. He thought it was very desirable that there should be an investigation to ascertain whether anything could be recovered, and to see what steps should be taken to put the Public Prosecutor on the track of Eaton. He related some of the experiences he had had with the Amman Valley Company and with Eaton.

Mrs. Goodson stated that she was interested in five other of these Companies as a share or debenture holder. She had received a letter to the effect that the Directors of one of the companies had no cash with which to pay the debenture interest for the past half year; and they therefore proposed to defer payment until Sept. 29 next.

Mr. How said he visited the Ticehurst district some two years since; and, in his opinion, there was not much in the shape of assets. He found there was something like water-works there; but he did not see any gas-works.

Mr. M. Seeck considered the information the shareholders had was quite sufficient to show that the assets were practically *nil*. He thought it would be best to "go" at once for the promoters and those responsible for the expenditure of the money.

Mr. M. J. Jarvis (Solicitor) inquired whether it would not be better to pass a resolution for the removal of the Directors first, and so get in the shareholders' own nominees.

In the course of further discussion, it was mentioned that letters had been received from debenture holders who stated that they had not received their interest. One lady at the meeting said she had received hers, but only by the application of pressure. It was thought by Mr. Hooper that a Committee of Shareholders should have a valuation made by a responsible engineer or surveyor; and then seek Counsel's opinion as to the best method of making Mr. Eaton disgorge some of the money belonging to the shareholders. From another quarter came the advice that as Mr. Eaton was in such "hot water" with other people, whatever was done should be done quickly. What they had to do was to save the assets.

In much the same strain, the discussion continued; and it ended by the following resolution, proposed by Mr. R. Dean, and seconded by Mr. Seeck, being unanimously adopted: "That Mr. Glover be requested to take the opinion of Counsel as to the course to be adopted for the recovery of the shareholders' money, and to employ the necessary expert evidence and assistance to obtain it, and to report to the shareholders."

A vote of thanks was passed to Mr. Glover for the initiative he had taken in this matter, and for his conduct of the proceedings.

THE PROPOSED NEW GAS-WORKS FOR BELFAST.

The Question of a Site.

At a recent Meeting of the Gas Committee of the Belfast Corporation, the City Surveyor (Mr. H. A. Cutler) and the Gas Engineer and Manager (Mr. Robert Sharpe) submitted a statement furnishing the following particulars in regard to the various proposed sites for the new gas-works: Ormeau Park (area 27 acres)—Works site capacity in cubic feet per day gas output, 10 millions; capitalized cost of site, £24,345; cost per million cubic feet capacity, £18,003. Ormeau Park and Glentoran (area 25 a. 2 r. 12 p.)—Works site capacity, 10 millions; capitalized cost of site, £23,720; cost per million cubic feet capacity, £18,560. Donegall Road (area 52 acres)—Works site capacity, 20 millions; capitalized cost of site, £25,535; cost per million cubic feet capacity, £19,999. Cranmore (area 30 acres)—Works site capacity, 10 millions; capitalized cost of site, £4200; cost per million cubic feet capacity, £22,078. Twin Island (area 56 acres)—Works site capacity, 20 millions; capitalized cost of site, £42,000; cost per million cubic feet capacity, £14,692. Brick-Works (area 26½ acres)—Works site capacity, 10 millions; capitalized cost of site, £9938; cost per million cubic feet capacity, £18,053. In a note attached to the statement, it was mentioned that the cost of the works to the ground level and the loss on the carriage of coal had been estimated for works of 10 million cubic feet daily capacity for all the sites; but the areas of land estimated for the Donegall Road and Twin Island sites were sufficient for works of 20 millions daily capacity; so that in both these cases it was necessary to deduct half the capitalized cost of land in arriving at the cost per million cubic feet capacity.

The statement having been fully considered by the Committee, Mr. Squire moved, and Mr. Workman seconded—"That it be reported to the Council that, having made very full inquiries as to the merits of the sites offered for the auxiliary gas-works, the Committee are of the opinion that the site known as the East Twin site, containing an area of 56 acres, would be the most advantageous for the purpose; and they recommend the Council to authorize the Committee to enter into provisional arrangement with the Harbour Commissioners, and to proceed to obtain all the necessary parliamentary and other powers." To this an amendment was moved—"That all the sites be sent forward, and that we recommend the Council to select from the sites known as the Twin Island, the Ormeau

Park, and Donegall Road, the most suitable." The Committee having divided on the amendment, it was declared lost. A further amendment was moved—"That all the sites selected be voted upon in the order of merit, and reported to the Council in that order;" and this was agreed to. Accordingly, a vote was taken, with the result that it was resolved —"That it be reported to the Council that the following three sites are, in the opinion of the Committee, the most advantageous: East Twin Island, Ormeau Park, and Brick-Works; that the Committee are equally divided as to whether the Twin Island or the Ormeau Park is the most advantageous of all the sites offered; and the majority of the Committee are of opinion that the Brick-Works site is the third most suitable of those offered." It was then resolved to request the Lord Mayor to convene a meeting of the Corporation to select a site.

A special meeting of the Council of the County Borough of Belfast was held last Thursday, to receive the minutes of the Gas Committee relative to the selection of a site for the proposed auxiliary gas-works, and to authorize the taking of the necessary steps to acquire it. The subject was introduced at some length by Mr. Doran, the Chairman of the Committee; but, after some discussion, its further consideration was adjourned till to-day.

ROCHDALE CORPORATION GAS UNDERTAKING.

Lower Coal and Oil Contracts—Proposed Reduction of Candle Power.

The Gas Committee of the Rochdale Corporation last Wednesday accepted tenders for the supply of coal for the gas-works during the ensuing year. There were 37 tenders, and they had been carefully considered by the Works Sub-Committee, who submitted their report and recommendations. The Committee gave orders to twelve or thirteen firms; the total quantity to be supplied being about 55,000 tons. The prices average about 9d. per ton less than last year, which means a saving of £2000 to the Gas Department. The coal will be obtained from fifteen different pits. A larger quantity is being procured from Yorkshire than has been done for a considerable time; and this, it is stated, accounts for a substantial portion of the reduced cost. More orders than usual have gone to local firms. The Committee also decided to enter into contracts for the supply of 800 tons of petroleum to be used in the manufacture of carburetted water gas. Here again the price showed a reduction; being the lowest the Committee have paid. The having on these contracts is about £400.

The Committee also passed a resolution directing the Town Clerk to apply for a Provisional Order from the Local Government Board to enable them to vary the illuminating power of the gas supplied in the borough, and alter the arrangements for testing it. This action was taken on the recommendation of the Engineer and Manager (Mr. T. Banbury Ball) and the Works Sub-Committee. For many years the illuminating power of the gas has been about 18 candles. The Corporation, under their Act of 1872, have power to lower it to 16 candles; and it is understood that it is not proposed to go below this at present. With a reduction to 16-candle power, the saving is estimated to be between £2000 and £3000.

TORQUAY GAS COMPANY.

Reduction in Price—Electricity v. Gas for Street Lighting.

The Half-Yearly Meeting of the Torquay Gas Company was held last Wednesday—Mr. W. B. Beynon, the Vice-Chairman, presiding.

The Secretary (Mr. R. P. Kitson) read the notice convening the meeting, and also the report and accounts for the six months ending the 30th of June. They showed that the income was £17,967 and the expenditure £14,303. Payment of the half-year's dividend would absorb £3411; and there would be left a surplus of £253. Coals cost £2250 less than in the corresponding half of 1908; and even with the oil and coke used for the new oil-gas plant, which was not working last year, the cost of raw material showed a reduction of £1150. There was a saving of nearly £200 in purification—a satisfactory result of the new system which had been adopted. In accordance with the wishes expressed by the Directors and shareholders, a bonus amounting to £372 had been paid to the employees, to commemorate the jubilee year of the Company. The sale of gas had realized £250 more than before; but there was some reduction in the revenue from residuals. It had been decided that from the 29th inst. the price of gas for ordinary consumption should be reduced from 3s. to 2s. 11d. per 1000 cubic feet.

The Chairman moved the adoption of the report and accounts, and the payment of interim dividends at the rates of 10 and 7 per cent. He congratulated the shareholders on the progressive character of the Company's business, and said the further reduction in price would no doubt tend to stimulate consumption.

Mr. Young, in seconding the motion, referred to a new departure which had been made in appointing an inspector to bring to the notice of people the great advantage of the use of gas at low price, and to advise as to lighting, cooking, and heating. He thought that this would have good results in retaining consumers.

Mr. Martin suggested that it might be advisable to also have a lady inspector to give hints and advice to cooks and others as to the best use of cooking-stoves. Attention might likewise be drawn to the fact that gas under pressure gives a better light than electricity, at something like half the cost.

Mr. Young, referring to the suggestion to have a lady inspector, said he thought the arrangement already made would answer all purposes; but if in the future a second appointment was made, it might be a lady. As to the supply of gas under pressure, the street lighting in Torquay was under the control of the Corporation, who owned the electric light works. Under these circumstances, it was most difficult for a Gas Company to induce the Corporation, no matter how cheap the supply of gas might be, or how brilliantly they could light the streets, to oust the electric light. Corporations who had this light under their control gave the preference—naturally, perhaps—to the product of their own undertaking, though the cost might be two or three times as much as that of gas. He believed that in Torquay at present the streets could be lighted better by gas than by electricity, and at half the outlay. In fact, a penny rate was being lost by the use of electricity for street lighting. The price charged by the Corporation should be £10 or £12 a year, instead of the £20 paid for the very indifferent arc lights.

The motion having been carried, thanks were accorded to the Chairman for presiding; and the proceedings closed.

NOTABLE ACHIEVEMENT AT NEWPORT (MON.).

Lighting of Rogerstone.

In July last year the lighting of Rogerstone, Tydu, and Cefn was determined upon by the Parish Council. A movement had been previously set on foot to introduce electric lighting; but when it was found that only 27 public lamps could be obtained at the cost of a 3d. rate, and that the introduction of electricity would be useless for the purpose of cooking and heating, the Council became convinced that there was no other scheme to equal the one which had been proposed for their acceptance by the Newport (Mon.) Gas Company. All the above-named districts are in the Company's statutory area of supply.

For various reasons of a legal character, the actual order to the Company for the lighting was not given until the 14th of April last. It involved altogether the laying of upwards of seven miles of mains and some 420 services, both for private consumers and public lamps. About 300 additional houses are also expected to be built very shortly in the district. The work was commenced on the 13th of May; and on the 1st inst. Rogerstone was lighted by gas. At that date also, the whole of the seven miles of mains had been completed, the entire number of the public lamps erected, and more than half the services laid. The 5-inch trunk main connecting the Mill-Street works of the Company with Rogerstone (a length of 2½ miles) was laid in a month. For more than a quarter of this distance the excavation for the main was in rock, and the greater portion of the remainder in ordinary macadam.

The lighting is on the high-pressure incandescent system. The gas is compressed at the works, and sent to the end of the trunk main, where the high pressure is converted into any grade of low pressure that may be required, according to the circumstances of supply in the district. The compressors were made by the Bryan Donkin Company, Limited, the steel trunk main by the British Mannesmann Tube Company, Limited, the cast-iron mains by Messrs. Jordans, Limited, and the lamp-pillars by Messrs. T. Spittle, Limited. The burners in the public lamps give a splendid light. The governors for transforming the pressure, though made in England, are the Johnson-Reynolds, which are extensively used in the United States. They were first introduced into Europe by Mr. Thomas Canning, the Engineer and Manager of the Newport Gas Company. The work, which was executed by direct labour, was supervised throughout by Mr. H. D. Hazell, under the direction of Mr. Canning.

LEIGH-ON-SEA GAS UNDERTAKING.

Ratepayers Discuss the Position.

A Public Meeting, convened by the Leigh Ratepayers' Association, was held last Tuesday, under the presidency of Mr. F. J. Green, to consider the position of the Urban District Council gas undertaking.

Mr. F. S. Farris, in opening the discussion, traced the history of the gas-works from the time they were taken over by the Council. He said it was thought by many that they would be nothing but a "white elephant." Some people considered they did not and would not pay. But he knew that they did pay, and he was certain that they would continue to do so. He did not think, however, that they got as much from them as they should get, as the bye-products could have been worked much more profitably than they had been. Coke in particular could be sold in a different and better way than it was now. There was, too, a large amount of gas unaccounted for. Last year they made 17,376,000 cubic feet of gas, of which 15,350,000 cubic feet were accounted for; leaving 2,026,000 cubic feet unaccounted for. This quantity was far too great. The amount of gas they were making was 8000 cubic feet per ton of coal; whereas many other places made 11,000 cubic feet. As to the extension of the gas-works, the estimate had been exceeded; but he thought the extra expense was necessary, and would be more than repaid, inasmuch as the improvements carried out by means of the additional expenditure would allow of the work being done much better. The Gas Committee were amateurs in gas work. He certainly thought they should have the advice of an expert; and he was of opinion that there was a man now in the Council's service who was quite capable of filling the post. He moved—"(1) That this meeting expresses its confidence in the Gas Committee and thanks them for their services in connection with the reconstruction of the gas-works. (2) That this meeting recommends the Council to charge the cost of the proposed new gasholder against the reserve fund and the revenue account, and that in view of the fact that additional mains, stoves, meters, &c., must be continually provided to keep pace with the increasing consumption of gas, the Council should take steps to obtain greater borrowing powers without delay. (3) In order to create a greater demand for gas and economize its cost of production, this meeting recommends the Council to provide gas-fittings to houses, and fit them with slot-meters free of charge; to make it more widely known that coke can be obtained in retail quantities, and offer greater inducements for the inhabitants to purchase it; and to consider in what way the residual products can be rendered more valuable. To assist in carrying out these recommendations and to give advice to the Gas Committee, the permanent services of a man well up in theoretical and practical gas making in all its branches should be obtained; and they would suggest that Mr. Sargeant, the present Assistant Gas Manager, be offered the position."

This comprehensive motion having been discussed at some length,

Mr. N. Arnold, the Chairman of the Gas Committee, said it must

be admitted that the gas undertaking had not been much help to the ratepayers up till 1904. Before that time the works had had to be supported by the rates; but they had since paid their way, and accumulated £3000, despite the fact that when they were bought they were a bad bargain. They now had new buildings, which cost nothing like the amount expended on the old ones.

Others speakers followed with observations in favour of the gas undertaking.

Mr. DURRANT, the ex-Chairman of the Gas Committee, dealt with the question at some length, and submitted a number of figures. He concluded by moving, as an amendment: "That this meeting expresses its confidence in the Council's gas undertaking."

Mr. W. T. TAYLOR seconded the amendment.

Mr. S. F. JOHNSON thought that much of the criticism levelled against the gas-works was premature; and he did not consider they had had a fair chance of showing their capabilities as relievers of the rates. He hoped it would always be remembered that the gas undertaking was labouring under difficulties that should never have been placed upon it. There was no need for alarm over the gas-works; and his advice was that the ratepayers should hold on, as they had a good thing.

Mr. MEACHEN said that in the past he had criticized the gas undertaking; but when he was on the Council he served on the Gas Committee, and could say that it was one of the best working Committees the Council had ever had. The concern would be a profitable one if they only had patience.

The motion having been withdrawn, the amendment was carried unanimously.

BOLTON GAS AND ELECTRICITY UNDERTAKINGS.

Elective Auditor on the Accounts.

In his annual report on an audit of the Bolton Corporation accounts for the past year, Mr. W. A. Bridson, one of the Elective Auditors, makes the following reference to the gas fund: "The gross profit on this fund is the lowest since 1901. A steady decline is noticeable during the last three or four years, due to the increase in the use of the electric lighting system or incandescent lighting. The amount set apart out of revenue for the renewal of works and plant account—£7341, as against £11,294 in the previous year—seems very small, when we consider that during the year a sum of £14,404 has been spent on the re-building of the retort-house at the Lum Street works and the renewal of mains and meters. The balance to the credit of the depreciation account at the end of the year is shown at £5767, compared with £12,647 at the end of the previous year. The sale of meters and fittings for the twelve months, after charging wages, cost of materials, &c., shows a profit of £1162; while a loss of £816 is shown on the cooking and heating apparatus department. After making due provision for sinking fund charges, a sum of £17,500 is handed over for the relief of the rates. The balance in hand on the capital account is £26,409."

Dealing with the electricity undertaking, Mr. Bridson records a slight decrease in sales on the year, and adds: "The depreciation for the year written off the various assets of this fund appear to be quite inadequate—namely, £18,747; but against this instalment on loans to the extent of £12,829 has been written off, and the balance of £5917 is the actual amount placed to the credit of the account for the year to meet renewal of plant, &c. After allowing for all charges, the amount handed over for the relief of the rates was £6800, compared with £7500 in the preceding year; and a sum of £2680 was carried forward to the current year's revenue account." Mr. Bridson says the capital account is over-spent to the extent of £25,543; while the total amount of debt extinguished on this fund since the commencement is £87,582. During the year, the expenditure on capital account was £19,820, making a total outlay of £345,122.

The total debt of the borough is now £4,034,892; but there are accumulations of sinking fund amounting to £367,816, leaving a net debt of £3,667,076. Mr. Bridson puts down the realizable assets as follows: Gas-works, electricity works, tramways, water-works, markets, and chief rents, &c., at cost, £3,373,457; so that if all liabilities on the works were extinguished, there would be a net surplus of £845,153.

ELECTRIC LIGHTING IN THE CITY OF LONDON.

Proposed Great Disturbance of Streets.

A certain amount of consternation was caused in the City last week by the intimation, reported to the Court of Common Council on Thursday, by the Streets Committee, of a notification received from the County of London Electric Supply Company, Limited, of their intention to commence the laying and amending of extra high-pressure electric mains and three 2½-inch iron conduits crossing London Bridge, thence along the east side of the bridge to Adelaide Place and King William Street to Monument Station, crossing Eastcheap and going along the north-east side of King William Street to Lombard Street, crossing Cornhill and Threadneedle Street to a position facing the Bank of England near the intersection of Princes Street, thence northwards along the east side of this street to Lothbury, crossing Lothbury and thence along the east side of Moorgate Street to London Wall, crossing London Wall and thence northwards along the east side of Finsbury Pavement to South Place, and crossing South Place to the boundary of Finsbury, as indicated on a plan accompanying the notice.

Mr. Millar Wilkinson asked if there were no means of stopping this great upheaval of the streets, many of which had been recently repaired, in the very heart of the City. Here was an Electric Supply Company at Deptford wishing to furnish electricity at Hampstead; and they were going to disturb the whole of the central and busy parts of the City of London. He would move that the City Solicitor be requested to communicate with the Company to see if it were not possible even now to prevent this nuisance. The necessary permission having been given, the Lord Mayor called upon Sir Homewood Crawford to respond. He stated that the Company were acting quite within their powers in making application for permission to lay their mains along the route in question, under the Act of 1908; but, the Corporation could, if they were not satisfied, withhold their consent, and suggest an alternative route. If this were not acceptable to the Company, application for arbitration could be made to the Board of Trade, whose decision would be final. Mr. Millar Wilkinson then asked Mr. Turner, the Chairman (*pro tem.*) of the Streets Committee, if, in view of the fact that the statutory notice of one month given by the Company would expire on the 15th prox., he had considered the question of an alternative route; and, if not, whether he would call a special meeting of the Committee to deal with it. Mr. Turner replied that he was fully alive to the matter, and would consider the advisability of at once convening a special meeting of the Committee for the purpose mentioned.

KEIGHLEY CORPORATION GAS SUPPLY.

Reduction in Price.

At the Meeting of the Keighley Town Council last Tuesday, the Gas Committee presented a report for the year ended the 30th of June, which showed that the gross profits of the gas undertaking for this period had been £14,609. After meeting interest, the instalment of the sinking fund, renewals, and insurance charges, there was left a net profit of £6191. Of this sum, the Committee proposed to transfer £5550 to the relief of the rates; and they recommended that £50 be given to the funds of the Keighley Victoria Hospital, and that the gas charges be reduced to 2s. per 1000 cubic feet to ordinary consumers within the borough, and 2s. 3d. outside; to 2s. 1d. in the case of the public lighting authorities; and to 2s. 5d. to prepayment meter consumers, with proportionate reductions to large power users. In moving the adoption of the report, the Chairman of the Committee (Mr. John Harrison) explained that the output of gas for the year showed an increase of nearly 5 million cubic feet. The Committee estimated that a considerable saving would take place during the present year on account of cheaper coal, and there should also be economy in the working owing to the improved machinery which had been put in. It was hoped that the year would yield an additional profit of considerably more than £1000; and the reductions proposed would represent a total sum of upwards of £1100 per year; so that the gas consumers would benefit to this extent. Alderman King thought that the report was an extremely good one, and expressed his pleasure at seeing that at last they were getting the price of gas down to 2s. per 1000 cubic feet. Alderman Howley urged a reduction in the price of gas to prepayment meter users by making the charge to them 2s. 3d. instead of 2s. 5d. per 1000 cubic feet. He moved this as an amendment. After discussion, however, it was lost by 15 votes to 5; and the Committee's recommendations were adopted.

HOUSE-WIRING AND ELECTRICITY SUPPLY.

Are Cheaper Systems Possible?

The above subject was dealt with by "An Engineering Correspondent" in an article in the Engineering Supplement to "The Times" last Wednesday. The writer first considers the causes which have operated to render the present commercial prospects of the electricity supply business more uncertain than, in the opinion of many, they have ever been, and then proceeds to suggest remedies. He considers that the electricity supply authorities made a great mistake in not obtaining control over the sale of the new metallic filament lamps which have been introduced during the past three years, instead of leaving it in the hands of the contractors. The demand for these lamps has, he says, been enormous, and the results to the undertaking disastrous. Another factor which militates against their prosperity is the low rate of increase of new connections, or, expressed in other terms, the high cost of house-wiring. During the present year, several new and cheaper systems have been evolved; and, in the writer's opinion, the only way to acquire new connections is by pushing these cheaper wiring systems, by which electric light is brought within the reach of many who could not previously afford to have it installed. But it is pointed out that, while many unwired houses belonging to the middle classes would represent paying loads, even with metallic filament lamps, there are many more owned or tenanted by smaller people whom, under existing conditions of service and tariff, it would hardly pay to supply, and yet who, under the Statute, can compel the undertakers to connect them if they are within 20 yards of the mains. Therefore, though it might not be desirable for the authorities to push cheap wiring under existing conditions of services and tariffs, they must reckon with the eventuality that the electrical contractors will do so, just as they have done with the metallic filament lamps.

While, however, increased connections appear to be the salvation of the electricity supply undertakings, the writer points out that considerable care will have to be taken by the authorities that they do not lead to decreased revenue. In order to avoid this, there appear, he says, to be two methods immediately available, and a third which, sooner or later, will have to be adopted generally where it is not already in force. The first method is a technical one—namely, reduction in the cost of service. It involves the service cables, meter, cut-out, and labour. The second—the adjustment of the tariff to meet the new conditions—is a financial one. The writer considers that, essentially, what is required of an ideal tariff is that there shall be a first fixed charge on the consumer to meet the standing costs of the undertaking, and a second small charge to meet the running charges of the undertaking. The fixed charge being secured, the undertaking stands to make no loss even if the consumer does not use any current. There are several ways of securing the fixed charge, such as the Norwich system, which involves a percentage of the assessed value of the house; and making a definite charge per lamp installed per annum. Quite recently, the

Marylebone Borough Council have introduced a so-called "telephone" system of charging; the standing charges being secured by a sum fixed after an inspection of the installation, and based upon the probable maximum demand. What is certain is that the flat-rate and the maximum demand system, together with all scientific systems that attempt to make the consumer alter his methods of living or penalize him if he does not do so, "have turned out economic failures."

A third method, without which the second cannot be a success, and no electricity supply undertaking will prosper, is more drastic. On this matter the writer says: "Boards of Directors and Electricity Committees must wake up, and must recognize that electricity supply is a commercial and not a technical question. There is no reason why the new and cheaper methods of wiring now on the market should not bring in the increased revenue for which the undertakings are all thirsting. But the authorities should not leave it to the manufacturers and the contractors only to push the business, because by so doing they may lose control over new wiring systems, as they did with the new lamps." By using the word "control," the writer does not suggest that the business should be taken out of the hands of the genuine contractor; but the efforts of the electricity supply authorities should be directed to seeing that no installations are carried out which, by reason of insufficient number of light points or other causes, could in any way make the consumer an unprofitable customer.

WATER SCHEME FOR MONMOUTHSHIRE.

Proposed Water Board for the Western Valleys.

The Monmouthshire County Council, as well as a number of the Local Authorities of the county, have from time to time promoted various water schemes; but up to the present their efforts have been more or less unsuccessful. The Local Authorities of Abertillery, Abercarn, and Risca have lately again had the question under consideration. Abertillery already possesses a reservoir capable of storing 40 million gallons; but this, it is feared, is seriously interfered with by various subsidences. Abercarn is more gravely situated, for the district, which is rapidly increasing in population, is mainly dependent on mountain springs, and the supply of water is gradually diminishing as mining development takes place. The Risca Council have recently acquired the waterworks of the Western Valleys Gas and Water Company. But the supply is not sufficient for the demand; and as the population of the Risca area is increasing at a greater rate than in either of the other districts, the position has become serious.

It was with these facts before them that representatives of the Local Authorities mentioned assembled to consider the general position. After a number of meetings, they decided to ask Mr. Baldwin Latham to advise them. He has now presented a report in which he recommends the formation of a Water Board for the Western Valleys. He has submitted a number of schemes having the source of supply in the Grwyne Valley in Breconshire. A modified scheme shows the cost of constructing one reservoir in the valley at £250,000. It will have a capacity of 315 million gallons, will supply 1½ million gallons per day, and provide compensation water at the rate of 750,000 gallons daily. The site is at an altitude of 1650 feet, which will give ample pressure to supply the highest points in the district connected with the scheme. It is proposed to take over the whole of the existing liabilities of the three authorities interested—viz., Abertillery, £59,801; Risca, £30,000; and Abercarn, £8108—total, £98,000. It is also proposed to obtain parliamentary powers for supplying water to other authorities.

NEW CATALOGUES, &c.

The Richmond Gas Stove and Meter Company have, so far as we are aware, hit upon quite a novel idea in the issue of their "Richmond's gas-steam radiator post-card album." This contains four-dozen picture post-cards, in eight different designs. The illustrations depict the adaptation of the gas-steam radiator to the heating of ball-rooms and theatres, factories and workshops, school buildings and class-rooms, places of worship, the modern home, shops, and public buildings. Thus a wide range of choice is offered; the idea being, of course, that the despatcher will use the particular card that is best calculated to attract the attention of the person with whom he is communicating. The cards have quite an attractive general appearance; and the illustrations are good. They should therefore prove useful missionaries in the cause of the gas-steam radiator.

In view of the extended adoption of mechanical appliances for the conveyance of material in gas-works, special interest attaches to the catalogue of Temperley fixed transporters just issued by Applebys Limited, with which firm is incorporated the Temperley Transporter Company. A description is given of the transporter; and this is followed by some exceedingly well-executed illustrations of various installations of it, accompanied by particulars. One of these shows the transporter at the Wavertree works of the Liverpool Gas Company; and another an electric trolley hoist transporter at the Paisley Corporation Gas-Works. The catalogue is quite an artistic production.

We have received from Messrs. Gibbons Bros., of Dudley, a copy of a new booklet which they are issuing, dealing with constructional steelwork. This illustrates a number of steel buildings, &c., of which the firm have recently carried out the manufacture and erection. The photographic reproductions are excellent; and the first two relate to a steel and brick retort-house constructed and erected complete by Messrs. Gibbons for a large gas-works in South Wales. Elevating, conveying, and screening plants, tanks, and fire-proof flooring are among the other types of work illustrated.

There has been sent to us by Messrs. G. Hands and Co., of No. 69, Farringdon Road, E.C., a copy of a nicely got-up booklet dealing with

the "Hands" lamps, both of the "Ordinary" and the "Dreadnought" pattern. These lamps are entirely British made; and the efficiency claimed for them is 125-candle power per burner for a consumption of 3 cubic feet per hour. All the working parts are interchangeable and easily accessible; while there are no glass chimneys to break, and the burners are so placed that a broken mantle cannot direct a jet of flame against the globe, and so break it. These patterns, intended for outside lighting, are stated to be absolutely weatherproof.

A new illustrated catalogue of gas-fittings, glassware, and accessories has been issued by the Wholesale Fittings Company, of Commercial Street, E., who, in addition to their own specialities, have acquired the goodwill of the Star Inverted Burner Company, whose burners and mantles they are consequently in a position to supply. The list contains numerous novelties; and also particulars relating to a cash prize distribution to customers who make the largest purchases of "Bonbac" mantles during the season from the 1st inst. to April 30 next.

Messrs. S. P. Catterson and Sons, of Newington Causeway, S.E., forward their gas-fittings catalogue for 1909-10, which contains illustrated particulars of the firm's glassware, incandescent burners, and sundries, as well as information with regard to lamps, &c., of various other well-known types.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

On Tuesday there was published in the "Glasgow Herald" an article, two columns in length, entitled "Light, Heat, Power," from the pen of Mr. A. Wilson, the Gas Engineer to the Corporation of Glasgow. Mr. Wilson's subject was the work of the Corporation Gas Department, some extracts from which are given. The author began with the statement that a considerable amount of surprise and incredulity is often expressed at the reported continued expansion and development of the departments and works for the supply of gas to large towns and cities, in view of the many competitors that are now in the field. Less than thirty years ago, gas consumed through flat-flame burners was the principal agent for illuminating purposes; candles and oil lamps being practically the only other means available for obtaining artificial light. At the present time, the choice of an artificial illuminant is not so limited. Electricity, petroleum, acetylene, and many forms of oil and carburetted air gas are offered to the public, and many claims are made by their suppliers as to the efficiency and economy of these various illuminants. The support given by the public to some of these systems of lighting must, without doubt, encroach materially on the business which at one time belonged almost exclusively to gas undertakings. Taking into consideration these encroachments, one need not wonder at the question being asked as to whether the demand for gas in large towns is really increasing. Figures were given, from the returns of representative undertakings, to show the vast increase—not far from being double—in the output of gas in the United Kingdom between 1888 and 1908. Then it was stated that gas lighting commenced in Glasgow in 1818, but that there is no record of the quantity manufactured until 1827, when meters were first used. In that year, the gas made was a little over 79 million cubic feet. The transfer to the Corporation took place in 1869; and figures were given showing that since then the amount expended on works and plant, less depreciation, has increased from £532,317 to £2,410,366, the gross revenue from £235,701 to £864,210, the annual make from 1,295,463,000 to 6,820,962,000 cubic feet, the number of consumers from 93,349 to 269,322, and that the price of gas has declined from 4s. 7d. to 2s. Then figures were given relating to the output of gas in the United Kingdom in 1904 and 1909, which, it was stated, proved beyond doubt that the gas business, instead of being in a decadent state, is really in a strong and vigorous condition. This fact is fully appreciated and valued at its true worth by investors in gas shares, and their confidence is proved by the published market quotations for gas stocks. The advantages of incandescent gas lighting were dwelt upon, after which it was stated that gas-cookers were another factor which had been of immense advantage to the gas authorities as well as to all classes of the community. The hiring out of gas-stoves commenced in Glasgow in 1885, in which year the number so placed was 431. In 1895, the number was 12,135; in 1905, 28,044; and in 1909, 48,548. Gas-engines using Glasgow gas numbered 632 in 1890; in 1900, 1584; and in 1909, 1690. Between 1904 and 1909 the horse power rose from 7383 to 19,003. Gas for manufacturing purposes is sold at the same price as for power—viz., 1s. 8d. per 1000 cubic feet. In 1906, the quantity used was 86,401,000 cubic feet; in 1907, 166,009,000 cubic feet; in 1908, 206,371,000 cubic feet; and in 1909, 222,756,000 cubic feet. A new source of revenue has in recent years been found among a class of consumers with whom gas departments were afraid, or did not until recently think it worth while, to do business, in the supply of gas by means of prepayment meters. Of these, there were 721 issued in 1905; in 1906, 11,100; in 1907, 27,177; in 1908, 35,446; and in 1909, 45,900. The gas consumed through these meters was: In 1906, 40,908 cubic feet; in 1907, 167,946 cubic feet; in 1908, 262,826 cubic feet; and in 1909, 297,598 cubic feet. During the last financial year, the quantity of coal carbonized amounted to 681,071 tons, costing £372,254; the quantity of coke sold was 280,116 tons, of a value amounting to £100,303; the value of the tar and ammoniacal liquor sold was £119,654; while the total wages bill for the department amounted to £229,323. Discussing the question of whether there were any prospects of further developments in the demand for gas, in addition to the natural increase due to the expansion of the city and suburbs, the author went on to state that there is not much probability in the meantime of any great reduction in manufacturing costs, and that, besides, the mere fact of reducing the gas 1d. per 1000 cubic feet (although in the total it means about £25,000 a year to the consumers) will not produce a large increase in the consumption. There ought to be, in addition to the gas used for lighting,

further large increases in the demands for power and manufacturing operations; but there is also, when compared with other cities, a practically undeveloped field in connection with the gas used for household purposes. Gas-fires and gas-heating appliances for all kinds of rooms, shops, and places of business, the heating of water for baths, lavatories, and culinary purposes, and the more extended use of gas-cookers, all offer tempting prizes in the way of increased consumption to the Gas Department, and at the same time would provide a much improved service to the public. To get hold of this new consumption, the Gas Department require to get more in touch with the consumers, and interest and educate them in the capabilities and advantages of gas, for lighting, heating, &c. The article, which ought to do much good to the Gas Department, concluded with a plea for the establishment of show-rooms for gas appliances in the principal districts of the city.

In the Greenock Town Council on Tuesday, the Gas Committee reported an increased make of gas in the month of August of over 2½ million cubic feet. In Committee, Mr. Forbes moved that the sum of £527 for new meters purchased during the year be charged to capital; and that £1077, the cost of the renewal of meters, be charged to revenue. Bailie Chalmers moved that the practice of charging the whole cost of meters to revenue be continued. The opinion of the Town Clerk was asked as to the competency of charging any part of the cost of meters or extension of mains to capital; and he stated that, under the provisions of the Greenock Gas Act of 1871, it was quite competent to charge the whole or a proportion of the cost of meters to capital, under a fair depreciation of their value; but it was not competent to charge the cost of the extension of mains to capital account. The Chairman's motion was carried in Committee, and afterwards in the Council. In submitting to the Council the gas accounts for the year, Treasurer N. M. Brown said that the estimate adopted last year provided for paying off a debit balance of £2756 of the previous year, and coming out at the close of the year with the debit balance reduced to £402; but the actual debit balance had come out at £2490. The income fell short of the estimate by £1545; and the expenditure was less than the estimate by £309. The accounts were adopted. Mr. Brown, the Convener of the Gas Committee, stated that in 1907 the number of gas consumers was 13,632, and in 1909 it was 14,281—an increase of 659. In 1907, the number of cooking appliances in use belonging to the Corporation was 1568, and in 1909 it was 2913—an increase of 1345.

The Hamilton Town Council held a special meeting on Thursday for reconsideration of the estimates and assessments, which were sent back to them by the Council at the last meeting, as mentioned in last week's "Notes." The Council possess a Municipal Buildings Fund, which has been created out of the profits in the Gas Department. The Assessments Committee on Thursday recommended that this fund, amounting to £6870, should be applied, to the extent of £6297, in liquidating the burgh debts, and that the balance be used in relief of the rates. This would allow of the rates being fixed at nearly 3d. per £1 lower than the Committee proposed at their last meeting. The proposal was adopted by the casting vote of Provost Pollock.

On Tuesday, the Water Engineer reported to the Dundee Water Committee that he had recently made an examination of the steel water-main on the Tay Bridge, and had found it wasted by corrosion. The pipe had been at work since 1887, or only 22 years, and it was evident that its life would be short compared with that of cast iron. To renew the pipe would cost about £5000; and the Engineer suggested that to meet this they might set aside any surplus they were likely to have in the future. The Committee unanimously adopted the suggestion.

The Greenock Corporation on Thursday agreed to proceed with the erection of mechanical filters to deal with 2 million gallons of water per day. It was explained by Mr. J. W. Bailey that in recent years complaints had been received regarding insufficiency of water in various parts of the town, and the fact that a torpedo factory was now being erected in the burgh was an additional reason why an effort should be made to improve the supply. After inspecting filters in a number of other towns, the Water Committee recommended that the offer of Messrs. Bell Bros., of Ravensthorpe, Yorks., for £6280, be accepted. The Council, by a large majority, adopted the recommendation.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Sept.* 25.

There has again been good demand, but supplies have been sufficient to cover all requirements, and prices have been no more than maintained. The closing quotations are £11 6s. 3d. per ton f.o.b. Hull, £11 8s. 9d. per ton f.o.b. Liverpool, and £11 10s. per ton f.o.b. Leith. For delivery over the near months, spot prices would be paid; but makers are looking for a premium of 2s. 6d. per ton, and business does not result. For delivery over the spring months, the quotations remain £11 12s. 6d. to £11 15s. per ton, according to port, but without finding buyers.

Nitrate of Soda.

There has been no change in this market; so that 9s. 6d. and 9s. 9d. per cwt. remain the quotations for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *Sept.* 27.

The markets for tar products have been dull throughout the past week. Pitch has been decidedly depressed during the last week or ten days, and considerably lower prices have been accepted on the Continent and in England for this article. In England, 27s. 9d. has been accepted on the east coast; while on the Continent the prices at which contracts have been taken do not leave even this figure. It is reported on good authority that the Germans have been selling in Belgium for delivery to the end of June next. Creosote is dull; and as the majority of makers are well sold, they are not at all anxious for business. Benzol is steady but quiet, and there is not very much demand for it,

except for delivery all over next year, for which sellers refuse to quote. Fifty-ninety per cent. benzol is steady; and for toluol there is a good demand, especially in the North. Solvent naphtha is steady, and makers are inclined to somewhat advance their figures. Carbolic is very weak, and Continental consumers will not offer more than 10¼d. to 10½d. f.o.b. east coast. Heavy oils are dull in sympathy with creosote.

The average values during the week were: Tar, 14s. to 18s. *ex* works. Pitch, London, 28s.; east coast, 27s. 6d. to 27s. 9d.; west coast, 26s. 6d. to 27s. 6d. f.a.s. Mersey ports, 27s. to 27s. 6d. f.o.b. others. Benzol, 90 per cent., casks included, London, 6¼d. to 6½d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7d. to 7¼d.; North, 6½d. to 6¾d. Toluol, casks included, London, 9d.; North, 8½d. to 8¾d. Crude naphtha, in bulk, London, 3½d. to 3¾d.; North, 3¼d. to 3½d.; solvent naphtha, casks included, London, 11d. to 11½d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 10½d. to 10¾d.; North, 9½d. to 9¾d. Creosote, in bulk, London, 2⅝d. to 2¾d.; North, 2⅛d. to 2⅜d. Heavy oils, in bulk, 2¾d. to 2⅞d. Carbolic acid, 60 per cent., casks included, east coast, 10½d. to 10¾d.; west coast, 10¼d. to 10½d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market has been steady during the past week. The principal Gas Companies still quote £11 10s. upon Beckton terms; but outside makes have been sold at £11 2s. 6d., while f.a.s. London is about £11 6s. 3d. In Hull, the market is about £11 5s. to £11 6s. 3d.; and in Liverpool, £11 6s. 3d. to £11 7s. 6d. In Leith, the makers are asking £11 10s. to £11 12s. 6d. for prompt, and £11 15s. for forward; but they cannot secure these figures.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a slight improvement in the demand for coal, and the prices are a little firmer; but the output is still kept low by some local and partial stoppages. In the steam coal trade, the request is fair, and the shipments have improved in some degree. Best Northumbrian steams are steady from about 11s. to 11s. 3d. per ton f.o.b. Second-class steams are from 9s. 9d. to 10s. 3d. per ton; and steam smalls are quiet, at about 4s. 9d. to 6s. In the gas coal trade, the demand shows the more rapid growth that is usual at this time of the year. There is a good inquiry for export; and thus the production seems to be well taken up. Durham gas coal varies in price according to quality. The general classes are quoted from 10s. to 11s. per ton f.o.b., while for "Wear specials," up to 11s. 9d. is quoted. There are more sales of gas coal for forward delivery over next year, including one of second-class Durham for Italy—about 25,000 tons, at a price which is expected to leave about 10s. 2d. to 10s. 3d. f.o.b.; but this is to some extent dependent on the rate of freight that may continue. At the same time, the tendency is towards a slight advance on current values. In coke, the market is firm, and good gas coke is steady in spite of the increase of the output. The current prices for good gas coke are 13s. to 13s. 4½d. per ton f.o.b. on the Tyne or the Wear.

Scotch Coal Trade.

It is reported that some substantial sales of coal have been made, for delivery over the next twelvemonth, at prices ranging about 1s. per ton over present rates. The enhanced price, and the early period at which these sales have taken place, give countenance to the view that trade is to be better next year, both in regard to price and volume, than it has been this year. The prices now quoted are: Ell 8s. 9d. to 10s. 6d. per ton f.o.b. Glasgow, splint 10s. 3d. to 10s. 6d., and steam 9s. 3d. to 9s. 6d. The shipments for the week amounted to 325,892 tons—an increase of 4795 tons upon the preceding week, but a decrease of 10,039 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,822,279 tons—an increase of 582,663 tons upon the corresponding period.

South Australian Gas Company.—At the annual general meeting of this Company, held at Adelaide on Thursday, the 26th ult., the accounts presented for the year ended the 30th of June showed that, after paying the usual dividends, writing off £7911 for depreciation, and adding £12,500 to the reserve fund, the balance carried forward was £30,160. The Directors stated that there had been a considerable increase in the expenditure for coal and wages and on renewals; but that the outlay had been met by larger sales of gas and residuals. At the Brompton works, additions to the retort-house were in progress, and a new tar-tank and sulphate store had been built. Land had been purchased at Port Adelaide, and an additional gasholder was being erected thereon. It would be necessary to provide a washer and scrubber, an exhauster, an engine, and a liquor tank at Glenelg.

New Water-Works for Skipton.—An interesting stage in connection with Skipton's new water-works scheme was reached last Thursday, when the members and officials of the Urban District Council journeyed to the reservoir at the foot of Embsay Moor, and witnessed the closing of the outlet-valve and the commencement of the storage process. The scheme has been in progress about five years, and is now nearing completion. The capacity of the reservoir will be about 150 million gallons. The cost of the undertaking is about £80,000. The Council were met on the works by Mr. C. M. Norrie, the Resident Engineer for Messrs. George H. Hill and Sons, who designed the scheme; and the ceremony of shutting off the water was performed by Mr. T. Duckett, the Chairman of the Water Committee. A few congratulatory speeches were made, and satisfaction was expressed with the quality and completeness of the entire work.

Alliance and Dublin Consumers' Gas Company.

In their report to be presented at the half-yearly meeting on Thursday, the Directors state that the gross revenue from all sources for the six months to June 30 amounts to £153,656; the expenditure, including interest on loan capital, &c., being £121,334—leaving a balance of profit of £32,322. The Directors recommend payment of dividends of 10 and 7 per cent. per annum on the respective shares. A sum of £36,357 will be required to pay these dividends. It will therefore be necessary to draw on the reserve fund to the extent of £4035. There will then remain to the credit of the fund the sum of £39,936. The Bill which the Company promoted in Parliament has now become an Act; having received the Royal Assent on Aug. 16. Thereby the Company have been authorized: To test the gas with the No. 2 "Metropolitan" argand burner, with a standard of 14 candles. To consolidate and convert into stock the ordinary share capital, bearing a uniform standard dividend at the rate of 5 per cent. per annum. To raise additional capital by the creation and issue of consolidated ordinary stock not exceeding £300,000, and to borrow in respect of same a further sum or sums not exceeding on the whole one-third of the additional capital. The standard price of gas to be reduced from 4s. 1d. to 3s. 7d. per 1000 cubic feet. An agreement has been entered into with the Corporation of Dublin that the price in the city for three years from next January shall not exceed 3s. 4d. per 1000 cubic feet, provided there is no considerable rise in the price of coal.

Extensions at the Gosport Gas-Works.—The Gosport Gas Company have in hand some important alterations in their manufacturing and storage plant. A new three-lift holder is being constructed, and when completed the storage capacity of the works will be 230,000 cubic feet, against 77,000 cubic feet in the existing single-lift holder. The distributing plant is being extended by the laying of a main to Lee-on-the-Solent.

Exmouth Water Supply.—A meeting of the Council was held last Wednesday, to consider a proposal by opponents of the Dotton scheme. Notice had been given by Mr. Carter of his intention to move, as an alternative to the Dotton proposal, that a trial boring be carried out on the Council's land adjoining the filter-beds. The Chairman (Mr. W. C. Creedy), however, quoted a section of the Exmouth Water Act, 1900, which reads: "Provided that the Council shall not on any of the said lands sink any well or bore or construct any works whatever for the purpose of collecting or abstracting underground water." He therefore ruled Mr. Carter's motion out of order. It was argued by some of the members that, as the land indicated in Mr. Carter's motion had been purchased since the Act was passed, it was not included in the proviso. The Chairman said that the purchase was made under the Water Act, and all the land in connection with the water-works was held on the same terms. He, however, hoped Mr. Carter would find a way of giving effect to his opinion that a supply of water could be obtained from the source indicated in his resolution.

Nuisance from an Electricity Works.

Some of the inhabitants of Torquay have been moved to approach the Local Government Board with the object of obtaining abatement of the nuisance caused by the municipal electricity works. Their action is not to be wondered at; the situation of the works is very unsuitable. On the one side is the Bath Saloon, the chief place of assembly in the town; and on the other is residential and business property of high rateable value. Four or five years ago, the Corporation came to the conclusion that the buildings, which had been put up for another purpose, were no longer suitable for use as an electricity station; and in view of a great expected development in connection with a tramway scheme, application was made for sanction to borrow £42,000 for the erection and equipment of another electricity works on a less conspicuous and a more suitable site. The Local Government Board decided against this proposal, on account of its extravagance; and the Corporation have since muddled along in the old station, cramming more machinery into it, and apparently producing a condition of things which residents in the vicinity find intolerable. Mr. A. A. G. Malet, who visited Torquay on Friday to investigate the causes of complaint on behalf of the Local Government Board, suggested that there was not much to complain of in the way of noise, as there was nothing more than a steady buzz of the machinery. The complainants' reply was that the continuance of the noise and vibration at night got on the nerves of visitors, who either went away prematurely or, if they stayed, complained, and so gave the neighbourhood a bad name. Another cause of annoyance was the smoke emitted from the chimney of the works; and there were also sulphur fumes and dust from the furnace ashes. The Town Clerk and the Chairman of the Electricity Committee (Mr. Blackler) put the best face possible on matters. A good deal of money, it seems, has been spent in endeavours to abate the smoke nuisance; and more effort is to be made in the same direction. One suggestion of the Corporation is that the chimney of the works shall be increased in height; but the people in the neighbourhood are opposed to this, because a big chimney will be an eyesore. Beyond getting promises that as much as possible shall be done to meet their wishes, the objectors to the nuisance do not seem to have gained much by their petition. The ultimate effect will no doubt be to stimulate the Corporation to fresh action in the provision of a more suitable generating station. Indeed, there was more than one hint of a possible move in this direction, which certainly seems desirable in the interest of the town.

In the course of the Budget statement made by Mr. Wall, the Treasurer of Victoria, in the Legislative Assembly last Wednesday, he mentioned the extensive deposit of coal found on the Powlett River as one of the most important discoveries of recent years. He said 25 million tons of coal of excellent quality had been proved; and there were well-defined thick seams underlying eight square miles. A Bill authorizing the establishment of a State colliery is to be introduced shortly.

Theft from a Gas-Meter at Beckenham.

At the Bromley Police Court, on Monday last week, Frank Lawrence, a youth, with no home, was charged with feloniously breaking and entering the shop at 7, Trinity Road, Beckenham, between the 4th and 6th inst., and stealing a loaf of bread, the property of Clara Mack, and at the same time and place 2s. 6d. cash, the property of the South Suburban Gas Company. Henry Moss, a meter inspector in the service of the Company, said he examined the meter, and found only 1d. in the money-box. On calculating the quantity of gas used since the money was last collected, he reckoned that 2s. 6d. worth of gas had been burnt. Prisoner denied taking the money, but pleaded guilty to taking the loaf. Detective Ward stated that the prisoner was convicted at the Court of begging in March, 1908. He was put into the care of the Court Missionary, and sent out to Canada, but returned by the same boat. He was a persistent petty thief, and they could not believe anything he said. He had twice broken open his mother's gas-meter, and this had been overlooked. His mother left the neighbourhood so as to be away from him. Accused was sentenced to fourteen days' imprisonment.

Serious Gas Explosions in Manchester.

A house in Plymouth Grove, Manchester, was partly wrecked by an explosion of gas last week, and Mr. Thomas Chappell, the occupier, and a friend were injured—the former so seriously that his removal to the Royal Infirmary was deemed necessary. An escape of gas had been detected in one of the rooms, and the two men proceeded to locate it. As soon as a match was struck there was a violent explosion, which shook the whole house, wrecked the windows, forced doors from their hinges, and damaged the ceilings. The apartment in which the explosion occurred was set on fire; but the flames were soon extinguished. Mr. Chappell was burnt about the face and upper part of his body; but his companion escaped with very slight injuries. After surgical treatment at the Infirmary, Mr. Chappell was well enough to be taken home. An explosion of gas at a corner shop in Openshaw, Manchester, last Wednesday resulted in six or seven of the windows being blown out of their frames, and some damage caused to the walls. A servant girl had been boiling water on a gas-stove, and the explosion seems to have taken place when she turned off the gas. Taps inside the stove were turned on while the outside jets were being used; the result being an accumulation of gas inside. The girl sustained slight injuries.

Shortage of Water at Leicester.—In spite of the rainy summer, the water reservoirs of the Leicester Corporation show a deficiency of more than 1000 million gallons. So serious has the position become that the supply, which has been restricted for several weeks, will probably be still further limited unless there is a heavy rainfall in the near future. During the past month, the stock of water in the reservoirs has decreased 80 million gallons.

Paignton Water-Works Settlement.

The terms proposed for the settlement of the dispute between the Paignton District Council and the Contractors for the water-works (Messrs. Hawkings and Best), were considered at the last meeting of the Council. Mr. Parnell, the Chairman, when moving that the Contractors be paid £10,000 in full discharge, said the settlement was one that must be regarded as satisfactory. The contract price for the dam and works on Dartmoor was £22,555; but by the time the work was finished, the extras amounted to £29,000, and in addition they received a claim from the Contractors for £40,000—making in all a sum of about £90,000. The matter was referred to arbitration; and after the Court had been sitting for two days, an offer was made on behalf of the Council of £10,000, which was not entertained. When the arbitration had been proceeding for a fortnight, a question arose as to what were the functions and duties of the Engineers; and the proceedings were adjourned with a view to getting this point decided in the High Court. In the meantime, efforts had been made to effect a settlement; and these resulted in a conference at which the agreement now presented for confirmation was arrived at. It was a subject for congratulation that the dispute was thus ended; for if the litigation had continued, it would probably have extended over eighteen months or two years, and £6000 would have been swallowed up in law costs. Mr. Sarson, to whose sagacious diplomacy in arranging the settlement the Chairman paid a tribute, expressed the opinion that the terms agreed upon were eminently satisfactory from the Council's point of view, and would leave no ill-feeling behind on the part of the Contractors. The Chairman explained that it was anticipated that a loan would be sanctioned for the amount now required to settle their liability with regard to the water-works. They also hoped that before long they would get the period of repayment of the loan extended to sixty years. A resolution approving of the settlement was carried; and the Clerk was instructed to take the necessary steps for obtaining the Local Government Board's sanction to a loan.

Town Lighting by Acetylene in France.—In one of the "Notes on Gas Lighting" in the current number of the "Ironmonger," reference is made to a communication by M. L'Hermite to the "Revue Générale de l'Acétylène," to the effect that four more French communes—viz., Hangest-en-Sauternes (Somme), Ry (Seine-Inférieure), Lieurey (Eure), and Boissy-le-Sec (Eure-et-Loire)—are deciding on the adoption of acetylene lighting. M. L'Hermite is a mechanical constructor at Louviers, and has specialized in the lighting of towns by acetylene. The writer of the note says it seems very probable that the extensions which are being made in this direction are due not only to the progress made from the mechanical and scientific side, but also to the fall in the price of carbide. But whether the hopeful predictions of the "Revue" that the towns lighted by acetylene in France will be counted by hundreds instead of by tens will be realized, remains to be seen.

Alleged Artful Theft.

Alfred John Bosber, aged 26, a gas engineer, of Mildmay Grove, Stoke Newington, was last week charged on remand at the Old Street Police Court with being a suspected person, loitering for the purpose of committing a felony. He was also further charged with stealing from an automatic gas-meter inside No. 21, Leopold Buildings, the sum of 12s., the money of the Gaslight and Coke Company. Mr. Humphreys prosecuted, and said the case was one of grave suspicion. The prisoner had hitherto borne an irreproachable character; but so far as the prosecution had been able to ascertain, tbe tale he now told was quite untrue. At the previous hearing, the prisoner (who was found by a resident in the buildings and handed over to tbe police) had told several stories, all of whicb would be disproved. Ada M'Hugh deposed that she saw the prisoner in some rooms in the building; and when questioned by her, he said he had just taken them. This tbe caretaker denied. Police evidence showed that, when arrested, the prisoner was found in possession of a number of keys, three of whicb fitted gas-meters in rooms in tbe building. The other keys were identified by the prisoner's wife as belonging to the house in which she lived witb the prisoner. In answer to the Magistrate (Mr. Cluer), she said that when her husband left her on the Saturday evening in question he had 1s. in silver and twelve pence whicb she had given him. The Magistrate: How much was found on the prisoner? Detective Pearce: Four shillings—three in silver and twelve pence. The Magistrate: Well, that is in the prisoner's favour somewhat. He is charged with stealing 12s. An official of the Gaslight and Coke Company said the index to the meter sbowed that 12s. should bave been in the box. Prisoner, who said be was not guilty, was committed to the Sessions.

Novel Point as to Water Charges.—A peculiar question as to charges for water has arisen at Tiverton. The town is in the happy position of having free water—an unconditional gift to the town by ancient Charter. In recent years, owing to the growtb of the population, this supply has had to be supplemented from another source. Consumers have been charged for this new supply; but as the water from both sources flows into the same mains, difficulties bave occasionally arisen as to the manner in wbich the charges should be apportioned when made. In some cases, a charge of £5 or £10 bas been made for the connection, and the water bas been supplied free; while in others, a yearly sum has been paid. At the last meeting of the Town Council, application was received from a laundry owner wbo has been paying £1 a year for a number of years for relief from tbis tax. Some of the members were in favour of remitting further payment; but others argued that as the water was used for trade purposes it should be paid for. They said that if water were supplied free in this case, it would be difficult to get the builders and brewers to pay for it. In the end, the matter was referred to a Committee for consideration; it being urged that, as the rates are 6s. 9d. in the pound, it was undesirable to impose further burdens on the ratepayers at large.

Improved Public Lighting in Wandsworth.—The Highways Committee of the Wandsworth Borough Council have had under consideration letters from the South Metropolitan Gas Company with regard to street lighting. Last February, the Company suggested that the lanterns and burners for new erections should be taken from existing lamps at the corners of some of the principal streets, and replaced by the Company's latest inverted burner lamps, each of which gives 50 per cent. more light at the same cost. The extra charge per lamp would be 3s., to cover the cost of labour; the cost of the lantern and burner being borne by the Company. In April, the Company informed the Council that a new inverted burner had been fitted in front of the Council House, and that their Superintendent of Lighting would attend at any time to explain its working, consumption, &c. In July, the Company wrote to the effect that the charges for public lighting would be reduced as from Midsummer last to the following figures: No. 2 burner lamps, £2 8s. 3d.; No. 3 burner lamps, £2 15s. 6d.; and No. 4 burner lamps, £3 2s. 10d.; that the charge for the new inverted burner would be reduced to £2 19s. 6d. per lamp per annum; and suggesting that the No. 3 and No. 4 burners should be replaced by those of the new inverted type. The Committee have given directions for the new burner to be fitted to twelve of the existing lamps at the corners of principal streets; and they will later report thereon to the Council.

Street Lighting at Weybridge.—Tbe Walton-on-Thames and Weybridge Gas Company having stated their willingness to renew the contract for the public lighting of Weybridge on the same terms as at present, the Highways Committee of the Urban District Council wrote to them expressing tbe opinion that there ought to be a reduction in the price, seeing that a great number of new lamps had been erected, and that tbe charge to ordinary consumers bad been lowered. The Company replied that for one year's lighting they were unable to quote less than £2 14s. per lamp; but for a three years' contract they would offer a 2s. reduction, making the charge £2 12s. Referring to the statement tbat, as the price of gas to ordinary consumers had been reduced, they considered the rate per lamp should be reduced also, the Company pointed out that wben they had been compelled to raise the charge for gas, owing to the great advances in the price of coal wbich had taken place in recent years, they had not increased the price to the Council for public lighting. The Committee also received an offer from the local Electric Ligbting Company to fit up with 50-candle metallic filament lamps, and light the whole of the street-lamps in the district for the sum of £2 17s. per lamp per annum on a five years' contract. This price was exclusive of tbe cost of painting. On the 215 lamps, electricity showed an excess of £54 over the reduced terms of the Gas Company. When the matter came before the Council, Dr. Willson remarked that one advantage of gas-lamps was that, even when they were put out, the bye-pass afforded some indication to drivers of vehicles as to wbicb side of the road they were on. As he did not suppose gas was likely to get mucb cheaper, he proposed that the Company's offer of a three years' contract should be accepted. This was carried unanimously.

Tar-Spraying of Roads Vetoed at Ilfracombe.—At a special meeting of the Ilfracombe Urban District Council last Tuesday, the Works Committee reported that they had resolved to recommend that provision be made in the forthcoming estimate for the sum of £100 to be expended in a scheme of tar treating the surface of certain of the main roads—this sum to include the cost of a tarring-machine which the Committee suggested should be purchased. They expressed the opinion that a similar sum should be provided in the March, 1910, estimate. The recommendation gave rise to considerable discussion. Mr. Drake said the scheme the Committee submitted was quite different from that adopted in regard to High Street this year. The tar was simply put on with a brush; but they proposed, with the aid of the machine, to put it on at a pressure of 100 lbs. per square inch. Several members favoured tar macadam, and thought that if the Committee's recommendation was carried out it would simply be a waste of money. A motion that the report be adopted was lost by one vote.

At the forthcoming meeting of the Imperial Continental Gas Association, the Directors will recommend the declaration of a dividend of 4 per cent. for the half year ending the 30th of June.

At a recent meeting of the Heywood and Middleton Water Board, it was stated that the expenditure on the new reservoir at Ashworth Moor totalled £240,038; this sum including £47,392 for land and interest during construction, but excluding £3296 spent on plans.

The most important item in the import trade of Hawaii from the United Kingdom is that of chemicals; and practically the entire import under this heading is sulphate of ammonia, which is largely used on the sugar plantations. The actual value of the chemicals imported from the United Kingdom during 1908 was £62,537.

Spontaneous combustion was the origin of the ignition of a stock of 20,000 tons of coal at Coatbridge a few days ago; and the fire obtained such a hold that it rapidly appeared that the whole stock was doomed. The coal had been stored by Messrs. Stewarts and Lloyds, as provision against the possibility of a miners' strike.

Including £4464 brought forward, the profit of Messrs. Sadler and Co., Limited, for the year ended June 30 was £27,431. The Directors recommend the payment of a dividend of 5 per cent., the placing of £5000 to reserve (making this fund £10,000), and the carrying forward of £3668. During the year, £3903 was expended out of revenue on works improvements, &c.

A singular difficulty has arisen in connection with the lighting of the parish church of Billingborough, in Lincolnshire. Owing to non-payment of the account for gas consumed, the supply has been cut off at the instance of the Gas Company. There are no other suitable means of lighting the church at night; consequently evensong is now being held in the afternoon.

It is reported that the ballot of the members of the thirteen Unions of the engineering and kindred trades in Manchester and district has resulted in the acceptance of the proposal that the present rates of wages shall remain undisturbed for a period of three years from the 30th inst., and that any subsequent alterations in rates of wages shall be subject to two months' notice.

According to the "Calcutta Times," in Siam, when the electric light goes out, the remedy is simple, as shown by the following notice: "Bangkok. Sir, for the case that your electric light should fail, we beg to send you enclosed a post-card, which please send us at once when you find your light out. The Company will then send you another post-card.—Yours truly, Manager, Siam Electricity Company, Limited."

The accounts of the Glenboig Union Fire Clay Company, Limited, for the year ending Aug. 31, after providing for maintenance of works and for current charges, and including £2180 brought in from the previous year, show a gross profit of £18,473. The Directors recommend that £3500 be allowed for depreciation, and £1500 for writing-down the cost of new electric plant. A dividend at the rate of 8 per cent., free of income-tax, will allow a balance of £1473 to be carried forward.

APPLICATIONS FOR LETTERS PATENT.

20,904.—Price, H. S., "Fluid meters." Sept. 13.

20,949.—Dempster, R., and Sons, Ltd., and Horsfall, J. E., "Gasholders." Sept. 14.

20,952.—Milne, J., and Alexander, W., "Prepayment meters." Sept. 14.

20,989.—Schönfeldt, F., "Locking cash-receptacles to coin-freed gas apparatus." Sept. 14.

21,003.—Graf, A., and Smyth, F. W., "Gas for lighting, heating, and power purposes." Sept. 14.

21,010.—Dr. C. Otto and Co. G. m. b. H., "Recovery of bye-products from gases derived from combustibles." Sept. 14.

21,033.—Fischer, J., "Gas-controlling devices." Sept. 14.

21,078.—Ehmann, C. P., "Preventing back-lighting in atmospheric gas-burners." Sept. 15.

21,096.—Robus, G. H., "Gas-heated irons." Sept. 15.

21,118.—Kindermann, J., "Exhaust-gas purifiers." Sept. 15.

21,126.—Blake, E. W., "Controlling the supply of gas to burners." Sept. 15.

21,171.—Wyler, B. F., "Gas-heating apparatus." Sept. 16.

21,236.—Breeden, J., and Co., Ltd., and Breeden, F., "Gas-lamps." Sept. 17.

21,358.—Stewarts and Lloyds, Ltd., and Ballantyne, R., "Fitting branch service connections to main-pipes." Sept. 18.

21,362.—Reynolds, J. G., "Gas heaters or stoves." Sept. 18.

21,366.—Still, E. H., "Incandescent gas-lamps." Sept. 18.

21,368.—Booth, H. C., "Hydrocarbon gas-plants." Sept. 18.

21,369.—Cambridge Scientific Instrument Co., Ltd., and Whipple, R. S., "Radiation pyrometers." Sept. 18.

21,375.—Genteur, D. A., "Manufacture of carburetted air." Sept. 18.

Last Sunday week, there was a trifling explosion at the Cambridge Gas-Works, by which two of the workmen were cut about the arms and face. The men are stated to have been fixing a glass in a hydraulic main, when the explosion (which was caused by one of the tar take-offs of one of the beds of retorts becoming partially stopped, preventing the pipes being sealed) occurred. The glass was splintered, and both men received a number of cuts. They came down the ladder unassisted; and first-aid was rendered by a fellow workman. They were then removed to the hospital, where their wounds were dressed.

While the value of coke as an auxiliary fuel in the household has been acknowledged ever since it came to be produced in considerable quantities in the process of gas manufacture, it is only comparatively recently that it has been brought within reach of the poorest classes of the community. Owing to the occupants of apartments in tenement houses, and even of West-end flats, not being able to find room for the amount of coke usually sent out by coal and coke merchants, it occurred to Mr. Corbet Woodall, the present Governor of the Gaslight and Coke Company, that these people might be served with small quantities delivered in paper bags. The system was highly successful, as shown by the results of three months' working in the case of the Tottenham and Edmonton Gas Company, of which Mr. Woodall is Chairman, furnished by Mr. A. E. Broadberry, the Engineer and Manager, to Mr. Robert Watson, of Doncaster, and included in the paper on "The Make and Sale of Coke" read by him at the meeting of the Manchester District Institution of Gas Engineers early in the year. On that occasion, Mr. Broadberry sent for inspection a sample of the bag he has in use, and gave the cost per 1000 printed. It seems only in the natural order of things, in view of the extraordinary extension of the "penny-in-the-slot" system of selling gas, that there should be a good field for the sale of small quantities of coke; and when this can be conveniently done, as we are reminded is now possible, in 28lb., 14lb., and even 7lb. bags, it seems scarcely necessary to direct the attention of gas managers to the facilities thus afforded for increasing their returns from this residual.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situation Vacant.

FITTER (MAIN AND SERVICE LAYING). Sunbury Gas Company.

Situations Wanted.

ASSISTANT ENGINEER AND DRAUGHTSMAN. No. 5141.
INCANDESCENT LIGHTING. No. 5140.

Plant, &c. (Second-Hand), for Sale.

STATION METER. No. 5137.
WASHER, CONDENSERS, EXHAUSTERS AND ENGINES, &c. Coventry Gas Department.

Patent Licences.

METERS. Haseltine, Lake, and Co., Chancery Lane, W.C.
TREATING COAL FOR COKING PURPOSES. Haseltine, Lake, and Co., Southampton Buildings, W.C.

Stocks and Shares.

ASCOT GAS AND ELECTRICITY COMPANY. Oct. 12.
LOWESTOFT WATER AND GAS COMPANY. Oct. 12.
SOUTHEND WATER COMPANY. Oct. 12.

TENDERS FOR

Coke.

BRIGHOUSE GAS DEPARTMENT. Tenders by Oct. 9.

Fires and Cookers.

SKIPTON GAS DEPARTMENT. Tenders by Oct. 6.

Oxide of Iron (New and Spent).

CLEATOR MOOR URBAN DISTRICT COUNCIL. Tenders by Oct. 2.
SALFORD GAS DEPARTMENT. Tenders by Oct. 7.
TEIGNMOUTH GAS DEPARTMENT.

Waggons.

STOURBRIDGE GAS DEPARTMENT. Tenders by Oct. 12.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 811.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 16	10	Alliance & Dublin 10 p.c.	18—19	+½	5 5 3
298,955	10	,,	7	Do. 7 p.c.	12¾—13¼	..	5 5 8
310,000	Stk.	July 14	4	Do. 4 p.c. Deb.	96—98	..	4 0 0
200,000	5	May 27	6½	Bombay, Ltd. . . .	5¾—6	..	5 8 4
40,000	5	,,	6½	Do. New, £4 paid .	4½—4¾	..	5 9 6
50,000	10	Aug. 26	15	Bournemouth Gas and Water 10 p.c. . .	28—28½	..	5 5 3
311,810	10	,,	7	Do. B 7 p.c. .	16¼—16¾	..	4 3 7
75,000	10	,,	6	Do. Pref. 6 p.c.	15⅜—15⅝	..	3 16 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	252—255	..	4 18 0
300,000	,,	,,	9½	Do. New . . .	190—192	..	4 19 0
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122	..	4 2 0
206,250	,,	June 11	4	Do. 4 p.c. Deb. .	100—102	..	3 18 5
220,000	Stk	Sep. 10	11	Brighton & Hove Orig.	208—213*	..	5 3 3
246,320	,,	,,	8	Do. A Ord. Stk. .	150—152*	..	5 5 3
460,000	20	Apl. 16	10	British	43—43½	..	4 11 11
109,000	Stk.	Aug. 26	6	Bromley, A 5 p.c. . .	118—120	+1	5 0 0
165,700	,,	,,	4½	Do. B 3½ p.c. . .	88—90	..	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c. . .	106—108	..	5 1 10
55,000	,,	June 25	3½	Do. 3½ p.c. Deb. .	88—90	..	3 17 9
500,000	10	May 13	7	Buenos Ayres (New) Ltd.	13¾—14¼	..	4 18 3
250,000	Stk.	June 25	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5	..	—
100,000	10	—	—	Do. 4½ p.c. Pref. .	5½—6	..	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	48½—49½	..	6 1 3
100,000	Stk.	June 25	4½	Do. 4½ p.c. Deb. Stk.	82—84	..	5 7 2
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord. . .	106½—108½	..	4 12 2
1,493,280	Stk.	Aug. 26	5 2/10	Commercial 4 p.c. Stk. .	108—110	..	4 14 7
560,000	,,	,,	5	Do. 3½ p.c. do. .	104—105	..	4 14 4
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	5	Continental Union, Ltd.	95—97	..	5 3 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—140	..	5 0 0
492,270	Stk.	—	5	Derby Con. Stk. . . .	121—123	..	4 1 4
55,000	,,	—	4	Do. Deb. Stk. . . .	103—105	..	3 16 2
148,995	,,	Mar. 31	5	East Hull 5 p.c. Ord. .	100—102	..	4 18 0
486,090	10	July 14	12	European, Ltd. . . .	24½—25	..	4 16 0
354,060	10	,,	12	Do. £7 10s. paid.	18½—19	..	4 14 9
15,141,545	Stk.	Aug. 12	4⅔	Gas Light and Coke 4 p.c. Ord. . .	105½—106½	..	4 7 7
2,600,000	,,	,,	3½	Do. 3½ p.c. max. . .	88—90	..	3 17 9
3,799,735	,,	,,	4	Do. 4 p.c. Con. Pref.	103—105	..	3 16 2
4,193,975	,,	June 11	3	Do. 3 p.c. Con. Deb.	85—87	−½	3 8 11
258,740	Stk.	Sep. 10	5	Hastings & St. L. 3½ p.c.	92—94*	..	5 6 4
82,500	,,	,,	6½	Do. do. 5 p.c.	117—119*	..	5 9 3
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	17¾—18¼	..	6 0 7
131,070	Stk.	Sep. 10	6½	Ilford A and C . . .	138—140*	..	4 12 10
65,780	,,	,,	5	Do. B	105—107	..	4 13 6
65,500	,,	June 25	4	Do. 4 p.c. Deb. . .	102—104	..	3 16 11
4,940,000	Stk.	May 13	8	Imperial Continental .	178—180	−1	4 8 11
1,235,000	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
195,242	Stk.	Aug. 26	6	Lea Bridge Ord. 5 p.c. .	119—121	..	4 19 2
561,000	Stk.	,,	10	Liverpool United A .	223—225	..	4 8 11
718,100	,,	,,	7	Do. B . .	165—167	..	4 3 10
306,083	,,	June 25	4	Do. Deb. Stk.	104—106	..	3 15 6
75,000	5	June 11	6	Malta & Mediterranean.	4⅞—5⅛	..	5 17 1
560,000	100	Apl. 1	5	Met of Melbourne 5 p.c. Deb.	102—105	..	4 15 2
250,000	100	,,	4½	Do. 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 27	3½	Monte Video. Ltd. . .	12¾—13¼	..	5 5 8
1,775,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	107—108	..	4 3 4
518,795	Stk.	June 25	3½	Do. 3½ p.c. Deb.	92—93	..	3 15 2
55,940	10	Aug. 26	7	North Middlesex 7 p.c.	13—13½	..	5 3 8
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	139—141	..	5 13 6
60,000	5	Sep. 10	8	Ottoman, Ltd. . . .	6—6¼*	..	6 8 0
31,800	53	Aug. 26	13	Portsea Island A. . .	137—139	..	4 19 0
60,000	50	,,	13	Do. B. . .	129—131	..	4 19 3
100,000	50	,,	12	Do. C. . .	120—123	..	4 17 7
114,800	50	,,	10	Do. D and E.	101—103	..	4 17 1
398,490	5	May 13	7	Primitiva Ord. . . .	7 1/16—7 5/16	+1/16	4 15 9
796,980	5	July 29	5	Do. 5 p.c Pref. .	5¼—5½	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb. .	94—96		4 3 4
1,000,000	10	Apl. 29	8	River Plate Ord. . .	16¾—17¼	..	4 12 9
312,650	Stk.	June 25	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Mar. 31	8	San Paulo, Ltd. . . .	14¼—14¾	..	5 8 6
62,500	10	,,	6	Do. 6 p.c. Pref. .	12—12½	..	4 16 0
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49½—50½	..	4 19 0
135,000	Stk.	Sep. 10	10	Sheffield A	230—232*	+1	4 6 2
209,981	,,	,,	10	Do. B	229—231*	..	4 6 7
523,500	,,	,,	10	Do. C	229—231*	..	4 6 7
70,000	10	June 11	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Aug. 12	5⅓	South Met., 4 p.c. Ord.	119—121	..	4 8 1
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	85—87	+½	3 8 11
209,820	Stk.	Aug. 26	8	South Shields Con. Stk.	153—155	..	5 3 3
605,000	Stk.	Aug. 12	5½	S'th Suburb'n Ord. 5 p.c.	118—120	..	4 11 8
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	May 13	5	Southampton Ord. . .	111—113	..	4 8 6
120,000	Stk.	Aug. 12	6⅞	Tottenham and Edmonton A 5 p.c. .	133—135	..	5 1 9
453,940	,,	,,	5⅜	Do. B 3½ p.c. .	111—113	..	4 15 3
149,470	,,	June 25	4	Do. 4 p.c. Deb.	100—102	..	3 18 5
182,380	10	June 11	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	109—111	..	4 10 1
255,636	Stk.	Aug. 26	6⅝	Wandsworth B 3½ p.c. . .	139—141	+1	4 14 0
79,416	,,	June 25	3	Do. 3 p.c. Deb. Stk.	73—75	..	4 0 0
895,872	,,	Aug. 12	5⅜	West Ham 5 p.c. Ord. .	124—126	..	4 5 4
210,000	,,	,,	5	Do. 5 p.c. Pref. . .	127—129	..	3 17 6
253,300	,,	June 25	4	Do. 4 p.c. Deb Stk..	112—114	..	3 10 2

Prices marked * are "Ex div."

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

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Resists 4500° Fahr. Best for GAS-WORKS.
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We guarantee promptness, with efficiency for Repairs.
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SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
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FOR REALLY HIGH-CLASS
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DRIVING AND CONVEYOR CHAINS.

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SPENCER'S PATENT HURDLE GRIDS.
THE very best Patent Grids for Holding Oxide Lightly.
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Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and 11, OLD HALL STREET, LIVERPOOL.

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It is also used for the enrichment of Gas.
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See Advertisement on p. 795.
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Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Sulphate of Ammonia.

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PREPARED from Pure Iron.
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Gives no back Pressure.
The Cheapest in the Market.
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The one Machine which Discharges and Charges at One Stroke.
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The work of these Departments is carried on in Separate Blocks of Buildings specially equipped for Systematic Instruction. Prospectus may be had free on Application from the Registrar.
The next Session begins on Oct. 5, 1909, on which day the entrance Examination will be held at Ten a.m. and Two p.m.

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- One Two Million Cubic Feet per diem LIVESEY WASHER, 10 ft. by 8 ft. by 3 ft. 6 in. deep, with 18-inch diameter Connections.
- Two Sets of Morris and Cutler's Water-Tube CONDENSERS, each of a Capacity of 750,000 Cubic Feet per diem, with 14-inch diameter Connections and Disc Valves.
- Three Batteries of Marshall's Water-Tube CONDENSERS, of a Capacity of Two Million Cubic Feet per diem, with 18-inch diameter Connections and Valves.
- Two Dempster's Reciprocating EXHAUSTERS, with STEAM-ENGINES on Same Bed Plate, Steam Governors, and Connections, and Disc Valves. One Set 60,000 Cubic Feet per hour, and the other 100,000 Cubic Feet per hour Capacity.

Further Particulars and Prices may be obtained from the undersigned.

Fletcher W. Stevenson, Engineer and Manager.

Gas-Works, Coventry, Sept. 22, 1909.

THE Cleator Moor Urban District Council invite TENDERS for the Supply of 80 Tons of OXIDE of IRON, delivered at Cleator Moor Gas-Works.

Endorsed Tenders to be sent to the undersigned on or before Oct. 2, 1909.

Henry Rothery, Clerk to the Council.

Public Offices, Cleator Moor, Sept. 21, 1909.

BOROUGH OF BRIGHOUSE.
(Gas Department.)

THE Gas Committee are prepared to receive OFFERS for 1500 Tons of Surplus COKE (best forked) for disposal from their Mill Lane Gas Works, Brighouse, during the Six Months ending the 31st of March, 1910.

Tenders, endorsed "Coke," to be addressed to the Town Clerk, Municipal Offices, Brighouse, on or before the 9th of October, 1909.

Tenders are to state Price per Ton loaded at the Gas-Works, and full Particulars of the Loading Charges to either Railway or Canal may be had on Application to

Harold Davies, Engineer and Manager.

Gas-Works, Brighouse, Sept. 28, 1909.

TEIGNMOUTH URBAN DISTRICT COUNCIL.
(Gas Department.)

OFFERS are invited for the Supply of 60 Tons of OXIDE OF IRON for Gas Purification. Prices, f.o.r. Teignmouth, and full Particulars to

J. Alex. Gray, Gas Manager.

URBAN DISTRICT COUNCIL OF STOURBRIDGE.
(Gas Department.)

THE Gas Committee invite Tenders for Ten 10-Ton RAILWAY WAGGONS.

Specification and all Particulars on Application to the undersigned.

The lowest or any Tender not necessarily accepted.

Latest day for Tenders, Oct. 12.

Charles H. Webb, Engineer and Manager.

Gas-Works, Stourbridge, Sept. 25, 1909.

COUNTY BOROUGH OF SALFORD.
(Gas Department.)

THE Gas Committee invite Tenders for the Purchase of about 1600 Tons of SPENT OXIDE.

Full Particulars and Form of Tender may be obtained on Application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Spent Oxide," to be delivered to me not later than Three p.m. on Thursday, the 7th of October, 1909.

L. C. Evans, Town Clerk.

Salford.

SKIPTON URBAN DISTRICT COUNCIL.
(Gas Department.)

THE Council invite Tenders for the Supply of GAS FIRES and COOKERS required during the period ending the 30th of June, 1910.

The average number Purchased during each of the past Four Years was 167.

Further Particulars may be obtained from Mr. J. H. Woodward, Manager, Gas-Works, Skipton, and Tenders, endorsed "Gas-Cookers," are to be sent to him on or before the 6th of October, 1909.

Richard Wilson, Clerk to the Council.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. Richards, at 18, Finsbury Circus, E.C.

By order of the Directors of the

SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF 750 NEW ORDINARY FIVE PER CENT. MAXIMUM £10 SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 12, at Two o'clock, in Lots.

Particulars of the Auctioneers, 18, Finsbury Circus, E.C.

By order of the Directors of the

LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY £10 SHARES,

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£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 12, at Two o'clock, in Lots.

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AND

200 £10 NEW ORDINARY SHARES.

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THE Proprietors of the Patent No. 19,479 of 1905, for "IMPROVEMENTS IN OR RELATING TO METERS," are desirous of entering into Arrangements by way of LICENSE and otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.

All Communications should be addressed in the first instance to Haseltine, Lake, and Co., Chartered Patent Agents and Consulting Engineers, 7 & 8, Southampton Buildings, Chancery Lane, London, W.C.

THE Proprietor of the Patent No. 17,580 of 1905, for "IMPROVED METHOD OF TREATING COAL FOR COKING PURPOSES," is desirous of entering into Arrangements, by way of LICENSE and Otherwise, on Reasonable Terms, for the purpose of EXPLOITING the same and ensuring its Full Development and Practical Working in this Country.

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By C. O. BANNISTER, Assoc.R.S.M., M.I.M.M.

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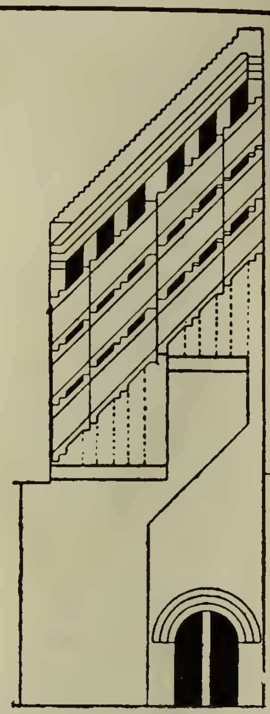
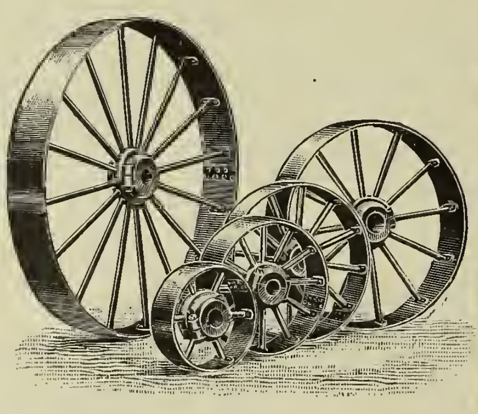
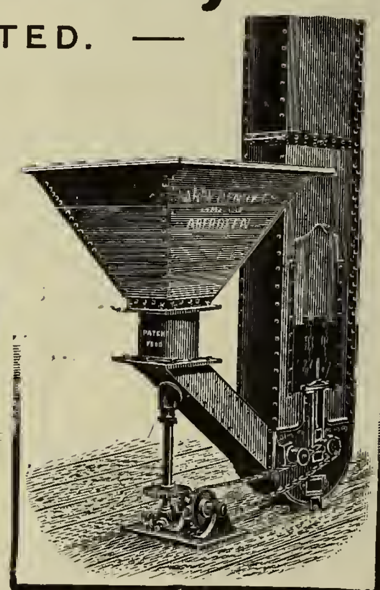
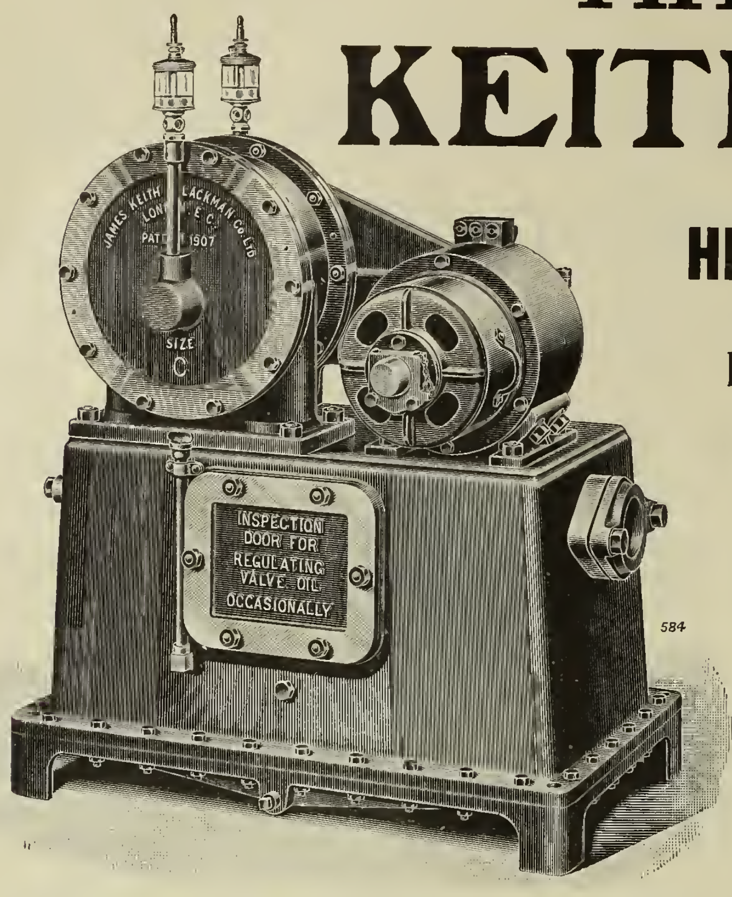






THE KEITH LIGHT



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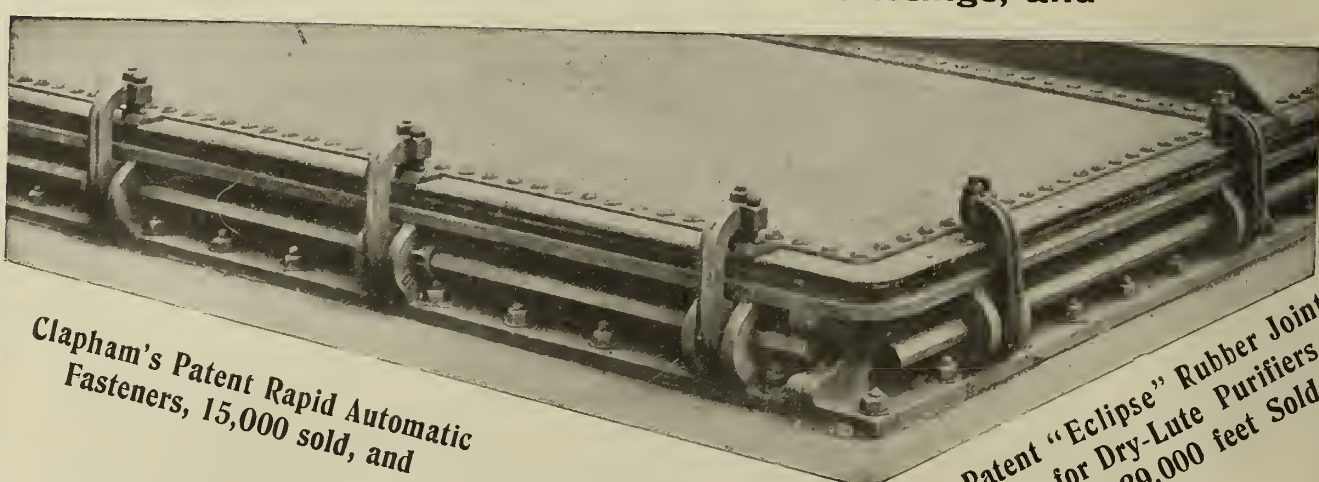

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